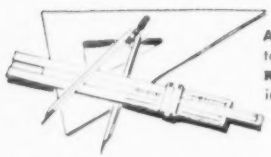
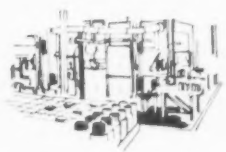
the OIL AND GAS JOURNAL

There is more than meets the eye..

..in REED TOOL JOINTS



Advanced design. The list of **REED** tool joint developments is assurance that **REED** Tool Joints contain all the latest improvements in design.



Precision heat treatment in these modern furnaces gives every **REED** Tool Joint the right combination of toughness and wear resistance.

120 separate inspections assure uniform high quality of every **REED** Tool Joint — minimizing the chance of premature failure.

YOU can't see the expensive alloys and the "tailored" heat treatment that help make **REED** Tool Joints last longer. Nor can you see the experience and integrity of the organization that stands behind every **REED** Tool Joint.

When you look closely, however, you can see the fine surface finish on the tool joint shoulder. You can see the pre-lubrication infused into the threads. You can see the **REED** Mark of Quality—the inspectors stamp that signifies that this tool joint has passed 120 exacting inspections.

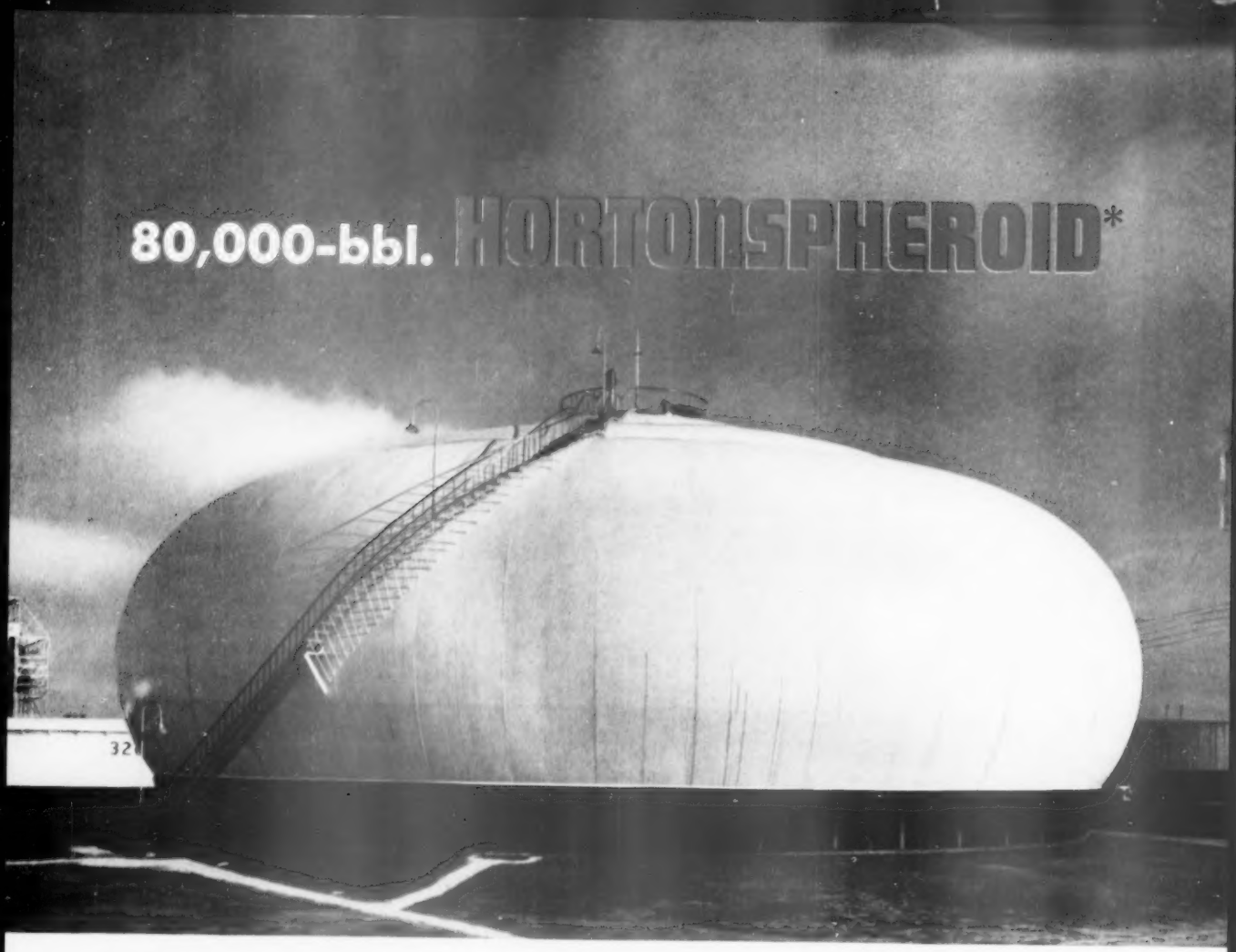
But whether you can see the difference or not, drilling contractors everywhere will tell you **REED** Tool Joints last longer.

REED ROLLER BIT COMPANY
HOUSTON 1, TEXAS

THE MARK OF QUALITY

4244

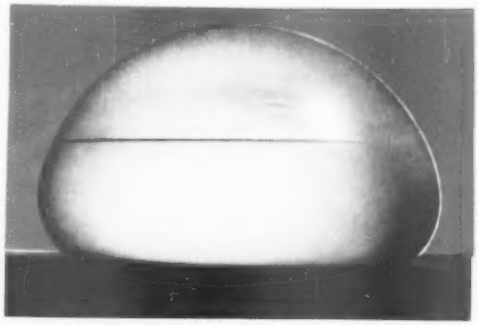
PRICE 50 CENTS TABLE OF CONTENTS ON PAGE 1 JUNE 8, 1953



built at a west coast refinery

The Union Oil Company has a modern answer to the old problem of storing volatile hydrocarbons such as motor gasolines and natural gasolines under pressure at its Wilmington, Calif., refinery. This 80,000-bbl. Hortonspheroid, which operates on the principle that no loss can occur unless vapor escapes from the vessel, is effective in reducing boiling, filling and breathing losses. It is entirely free from operating difficulties due to weather conditions and, with the exception of the relief valves, there are no moving parts to require expensive maintenance.

Further information, estimates or quotations concerning the Hortonspheroid or any other Horton structure may be had by writing our nearest office. There is no obligation on your part.



THE IDEAL SHAPE for a pressure storage tank for liquids is shown by this toy rubber balloon containing air and water under pressure. The Hortonspheroid is actually a modification of this shape.

* *Trade Mark Registered in U. S. Patent Office.*

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the OIL AND GAS JOURNAL

JUNE 8, 1953 VOL. 52 NO. 5

OIL IN THE NEWS . . .

El Dorado Layout Shows How Small Refiner Solved Octane Problem 60
NPC Committee Outlines Offshore Possibilities for Next 5 Years 62
New Idea in Coking Described at Wichita Meeting of W.P.R.A. 64
Crude-Purchasing Campaign to Support West Coast Line Under Way 65
Decision on Kelly-Snyder Flood Rules Pending With Commission 66
Supreme Court Ruling on Spraberry Shutdown Awaited by Operators 66
Reserve Producing Capacity Set at 914,000 Bbl. by NPC 67
Veteran Shooter Says Liquid Nitro Is Best Explosive 67
Several Problems Face Gas Industry, Burlingame Declares 68
Use of Contractor Cuts Drilling Costs, A.P.I. Meeting Told 69
Civil Cartel Suit Against Oil Companies Moved to New York 72
Agreement Covering Cooperative Action to Meet Shortages Approved 73
Imports Quotas Dead This Year Barring Upset in Congress 73
Industry Expansion Program Moving Ahead, PAD Reports 73
Iranian Shipments Since Nationalization Total About 500,000 Bbl. 76
Highly Paid Venezuelan Workers Seeking Shorter Hours, More Pay 77
Big Gain in Hungarian Output Indicated by Iron Curtain Reports 79
First-Quarter Italian Gas Output Up 90 Per Cent Over 1952 79
Tricounty Area in Oklahoma Scores Dozen New Discoveries 164
Organized Scouting Observes Its Thirtieth Anniversary 166
Springer Search Still Spreading 163

NEWS FEATURES . . .

They Say 45
Calendar of Events 50
Journally Speaking 55
Editorial 57
This week 59
Watching Washington 74
International News 76
Personals 81
Deaths in the Industry 83
Pipe-Line News 149
Drilling Contractors 154
Natural-Gas News 157
Natural-Gasoline News 157
Refining News 159
Petrochemical News 160
Exploration Statistics 188
Production Statistics 189
Refining Statistics 190
Market Statistics 191

TECHNOLOGY AND OPERATION . . .

[1]Oil and Gas Procedures for New Mexico 84
By Roy F. Carlson
[2]Hydrodesulfurization for Upgrading High-Sulfur Stocks 92
By H. Hoog, H. G. Klinkert, and A. Schaafsma
Buckeye Builds Northeast Products Line 98
By A. J. Helbrecht
[3]Combating Hydrogen Attack on Steel 100
Switchgear Maintenance in Petroleum Refineries 105
By H. B. Wortman
[4]Graphitization in Refining Equipment 110
By R. J. Fiorentino and A. M. Hall
[5]Thermofor Continuous Percolation 116
Three-Piece Rig for Shallow Drilling and Servicing 121
By Roy F. Carlson
On the Job . . . In Fields and Plants 124
Engineering Reference Section 133-142

DEPARTMENTS . . .

Journal Check Chart 91
Books 91
On the Job—Fields 124
On the Job—Plants 128
Engineering Reference 133
Refiner's Notebook 135
Modern Drilling 137
Engineering Fundamentals 139
Questions on Technology 141
Equipment Men in News 145
Active Rotary Rigs 156
Areal Field Reports 168
Classified Advertising 189
Advertisers' Index 193

In Brief . . .

1. NEW MEXICO OIL . . . All matters relating to the conservation of oil and gas in New Mexico are subject to the authority and jurisdiction of the Oil Conservation Commission. Function of the commission is to prevent waste of oil and gas and to protect correlation rights of all owners of oil and gas. Rules are formulated for all branches of the oil industry. Appropriate forms are required to be filled out on all operations.

•

2. ECONOMICAL SULFUR REMOVAL . . . A trickle hydrodesulfurization process has been developed for production of low-sulfur middle distillates from high-sulfur stocks. Features are: (1) savings in initial investment of 15 to 20 per cent over other processes; (2) 85 to 90 per cent sulfur removal; (3) production of byproduct high-octane gasoline; (4) reduced operating costs, compared to other processes.

•

3. COMBATING HYDROGEN ATTACK . . . Sulfur added as ammonium polysulfide is effective in preventing hydrogen attack by high-sulfur-content, water-containing light-hydrocarbon streams. Required rate of polysulfide addition to a 1,000-bbl. per day stream, containing 1 to 5 gal. of water per day, is 0.23 lb. per day. Experiments have proved 3.5 cu. ft. of oxygen per day, in place of the polysulfide, is also effective.

•

4. STEEL GRAPHITIZATION . . . A.P.I. Committee on Refinery Equipment reports: (1) to date, no instances of failure of refinery equipment have been observed in which graphitization could be considered either as the direct cause or as an important contributing factor; (2) continuous "eyebrow" type of graphite formation has not been observed in any samples; (3) none of the carbon-molybdenum steels examined have showed any evidence of graphitization.

•

5. DECOLORIZING LUBE OILS . . . The Thermofor continuous percolation process for decolorizing lube oils has a substantially lower investment cost than conventional static-bed percolation, and has a distinct advantage over hot contacting because of lower operating costs. The process, proved in pilot-plant work, is being put into commercial application on a 2,100-bbl. per day unit.

Who's wasting what? where?

Here's a competent and diligent worker doing what's needed to keep an important pipe line operating. How could that be a waste of high-priced maintenance time?

Maybe the waste was in buying valves and fittings that don't last. And in overlooking the fact that resulting upkeep, at today's maintenance rates especially, can quickly cancel out price tag "savings."

Waste of that kind can be avoided by thrifty buying. By insisting on better quality in piping equipment.

That's why buyers in so many plants today are looking for products that insure longer life, fewer repairs, less trouble in the line. And there's where Crane Quality shows up best. It's the dependable choice of thrifty buyers in every industry.

Crane Co., *General Offices:* 836 S. Michigan Ave., Chicago 5, Ill.
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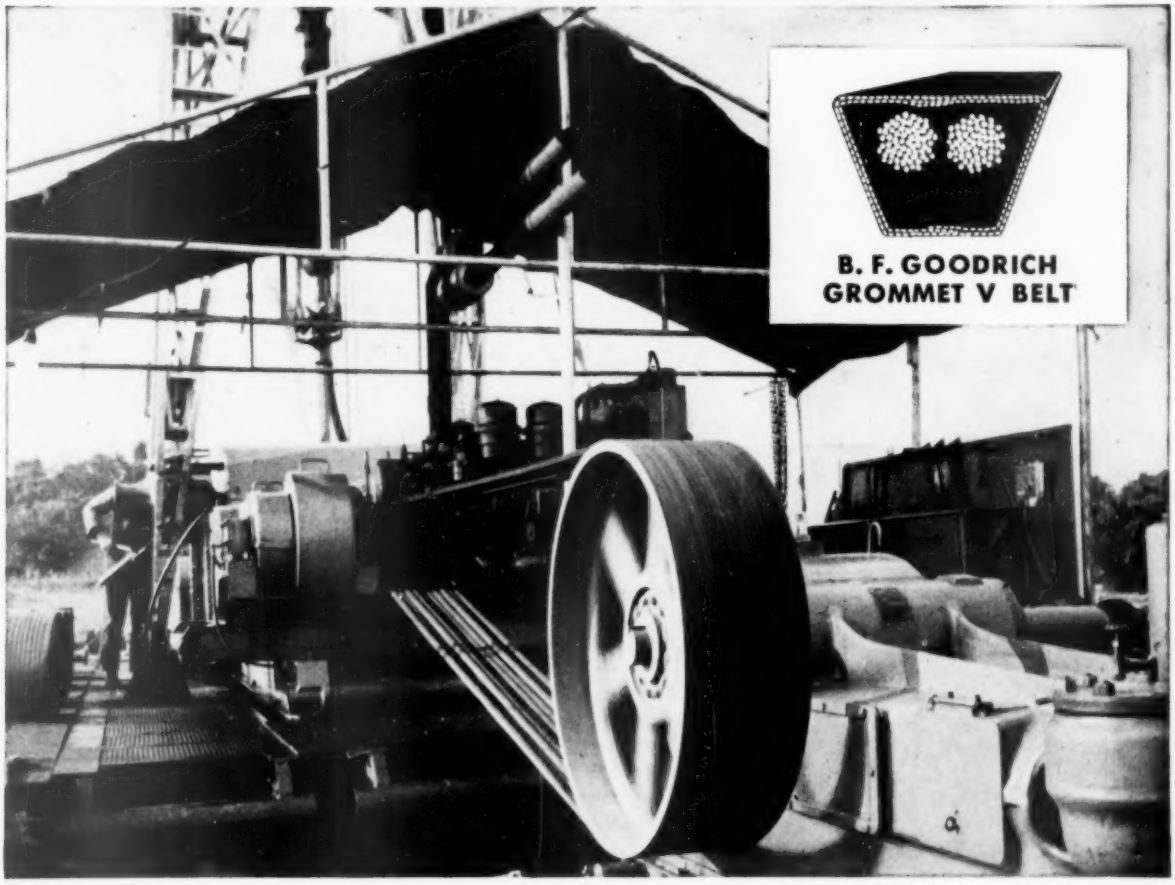
RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER



These B.F.Goodrich grommet belts now on 24th oil well

Grommet V belts last longer, serve better, save money

THESE B. F. Goodrich grommet V belts run the mud pump on an Oklahoma oil drilling rig. When the picture was taken, they'd been in continuous service for 14 months. And this job was their 23rd well, representing a total of 15 miles of drilling. In spite of the continuous high speed operation and exposure to all kinds of weather, these B. F. Goodrich belts showed very little wear, were moved to their 24th well. Here's why grommet V belts can cut costs 20 to 50%:

No cord ends — A grommet is endless, made by winding heavy cord on itself to form an endless loop. It has no overlapping ends. Because most of the failures in ordinary V belts occur in the region where cords overlap, the endless cord section in a grommet V belt eliminates such failures.

Concentrated cord strength — All of the cord material in a BFG grommet belt is *concentrated* in twin grommets, positioned close to the driving faces of the pulley. No layers of cords to rub against one another and generate heat; cord and adhesion failures are reduced. And grommet belts stretch less — only ⅓ as much, on an average, as ordinary V belts.

Better grip, less slip — Grommet V belts have more rubber in relation to belt size. Without any stiff overlap, they're more flexible, grip pulleys better. Size for size, grommet belts give ⅓ more gripping power, pull heavier loads with a higher safety factor. Because there is less slip, there is also less surface wear.

Only B. F. Goodrich makes the grommet belt—Available in C, D and E sections. Next time you need V belts, ask your local supply house for a set of grommet belts, or order direct from the nearest B. F. Goodrich warehouse—located in Dallas, Houston, Kilgore, Odessa, Wichita Falls, Oklahoma City, Tulsa, Williston, Denver and Los Angeles. *The B. F. Goodrich Company, Industrial & General Products Division, Akron, Ohio.*

Grommet V-Belts BY
B.F.Goodrich

Neilsen DI-HARD Subsurface Pumps with

"Locked Liner" and "Skirt Plunger"

...give OUTSTANDING SERVICE because:

Honed liner sections are locked together by steel bands, so are free from assembly and jacket distortions as well as from damage by outside impacts.

The DI-HARD sealing element slips over the steel plunger tube and is suspended from the top like a skirt, leaving it free from length-wise stress and with internal and external pressures greatly equalized.

1. **"DI-HARD" IS RECOGNIZED** to be the hardest and most corrosion-resistant material yet discovered for the wearing surfaces of subsurface pumps. Because it expands uniformly and has an extremely low coefficient of friction, it can be used in both liner and plunger without galling.

2. **SHORT SECTIONS LINED WITH DI-HARD** can be accurately honed. When these liner sections are (a) LOCKED together into full length tubes by (b) ***locking rings**** at the end of each section then (c) inserted in A.P.I. jackets and (d) finished honed to extreme accuracy . . . you have a hard, smooth, true pump bore of top quality.

3. **THE DI-HARD SEALING ELEMENT** is attached at the top of the steel plunger tube ***like a skirt****. The tube carries the pumping load. The DI-HARD element, finished to phenomenal accuracy and smoothness, makes an extremely close, low-friction seal and is free of pumping stresses at all times.

4. **THIS COMBINATION OF** (a) FINEST MATERIAL, (b) UNIQUE ENGINEERING and (c) OUTSTANDING ACCURACY enables you to pump your difficult wells over longer periods without pulling when you use NEILSEN DI-HARD LOCKED-LINER, SKIRT-PLUNGER SUBSURFACE PUMPS. Barrels are available in any length desired—in $1\frac{1}{2}$" rod pumps and in $1\frac{3}{4}$", $2\frac{1}{4}$" and $2\frac{3}{4}$" A.P.I. tubing pumps. Skirt Plungers are available for pumps of $1\frac{1}{2}$" bore and larger.

****An exclusive Neilsen feature.***

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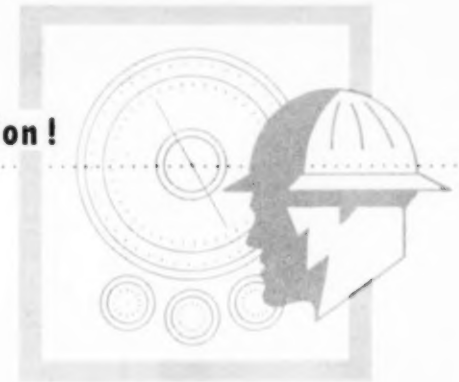
TRADE MARK

UNITED STATES STEEL

OPENS BY WEIGHT OF DRILL PIPE....

with positive surface indication!



HALLIBURTON'S *NEW*

HYDROSPRING TESTER

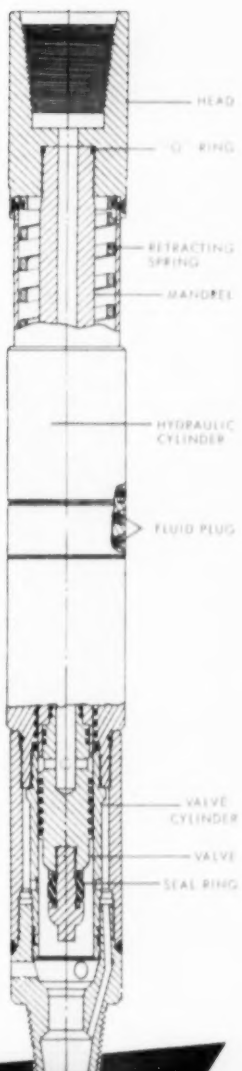
MORE THAN EVER, HALLIBURTON'S BEST FOR YOUR DRILL STEM TEST!

Now you have a testing tool that eliminates rotation, dropping of bar, or turning of J-slots to open. Hydrospring opens easily and positively by *weight of drill pipe* – a major step forward in the vital business of well testing.

And there's no guesswork about the Hydrospring Tester being open. A slight jar of the drill pipe and definite movement of the weight indicator needle give proof positive at the surface that the tool is open.

Here's the record of a recent testing job at Odessa, Texas: Total depth–11,850′; packer set–11,777′; TC Valve run three joints above tester; weight on tester–25,000 lb.; time to open tool–3′ 30″.

This is just one of more than 1500 perfect runs scored with Hydrospring.



There are additional advantages that set Hydrospring above ordinary testing tools: it is a combination tool requiring fewer assemblies; it can be run in rapidly to reach bottom quickly; it permits reversing off bottom simultaneously with taking closed-in pressure. And it can be rotated coming out of hole.

This miracle of modern testing is the result of Halliburton's continuous, energetic research and hard-won experience in the field. Combined with the Bourdon Tube Pressure Recording Device, this trouble-free, time-saving tool offers many exclusive features that make Halliburton best for your drill stem test!

Take advantage of Hydrospring Tester on your next job. Your Halliburton Testing Operator, only minutes away, is ready to swing into action when you call. Halliburton Oil Well Cementing Company, Duncan, Oklahoma.

HALLIBURTON

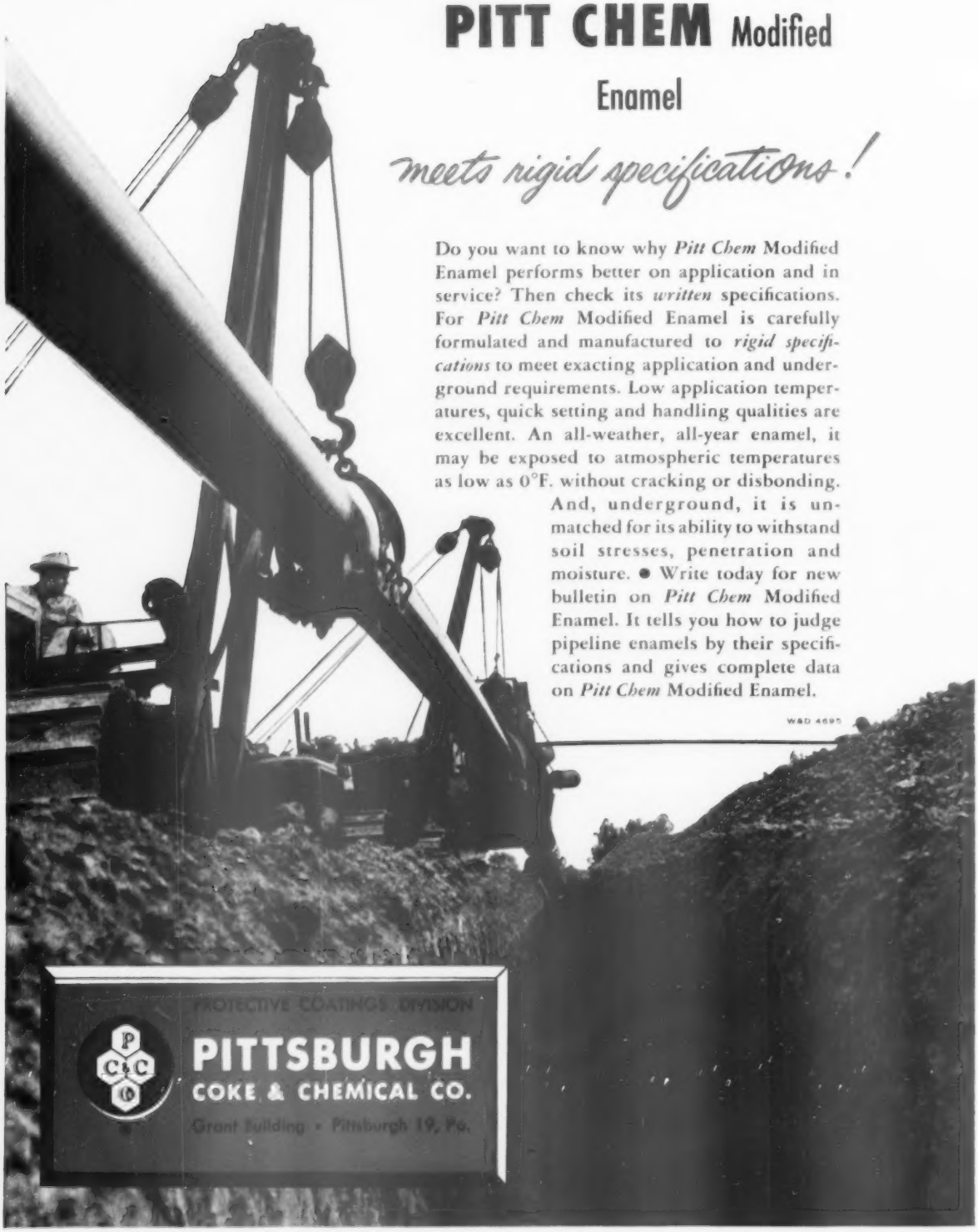
YEARS AHEAD IN DRILL STEM TESTING!

The Oil and Gas Journal, published Mondays, copyright 1953, by The Petroleum Publishing Company. Entered as second-class matter September 1, 1910, at post office at Tulsa, Okla., under act of March 3, 1879. U. S. and foreign rates to the petroleum industry, $4 yearly.

It's a <u>better</u> coating job because

PITT CHEM Modified Enamel

meets rigid specifications!



Do you want to know why *Pitt Chem* Modified Enamel performs better on application and in service? Then check its *written* specifications. For *Pitt Chem* Modified Enamel is carefully formulated and manufactured to *rigid specifications* to meet exacting application and underground requirements. Low application temperatures, quick setting and handling qualities are excellent. An all-weather, all-year enamel, it may be exposed to atmospheric temperatures as low as 0°F. without cracking or disbonding. And, underground, it is unmatched for its ability to withstand soil stresses, penetration and moisture. ● Write today for new bulletin on *Pitt Chem* Modified Enamel. It tells you how to judge pipeline enamels by their specifications and gives complete data on *Pitt Chem* Modified Enamel.

W&D 4695

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Slugging it out with desert dust

THERE's a section of the new Salt Lake-Boise pipeline near Mountain Home, Idaho, that offers as tough working conditions as you'll find anywhere.

The line, being built by Engineers Ltd. Pipeline Co., runs through desert terrain where blowing dust and sand batter against the tractors. Air cleaner sediment cups have to be emptied four to six times a day. Yet the 26 pieces of Cat* equipment on the job have stood up to the beating with practically no down time.

Some idea of the dust is shown in the picture above, where a Caterpillar D7 Tractor with No. 7A Bulldozer is backfilling the trench.

The owners like the steady-going production of their Cat earthmovers under conditions that would stop other machines dead in their tracks. And the operators like the handling ease of the angle-'dozers—their precise blade control and simple adjustment for changing blade positions.

Ask your Caterpillar Dealer for an on-the-job demonstration of the stamina and economy that have made these big yellow bulldozers famous. He backs every product he sells with reliable service and parts.

Caterpillar Tractor Co., Peoria, Illinois.

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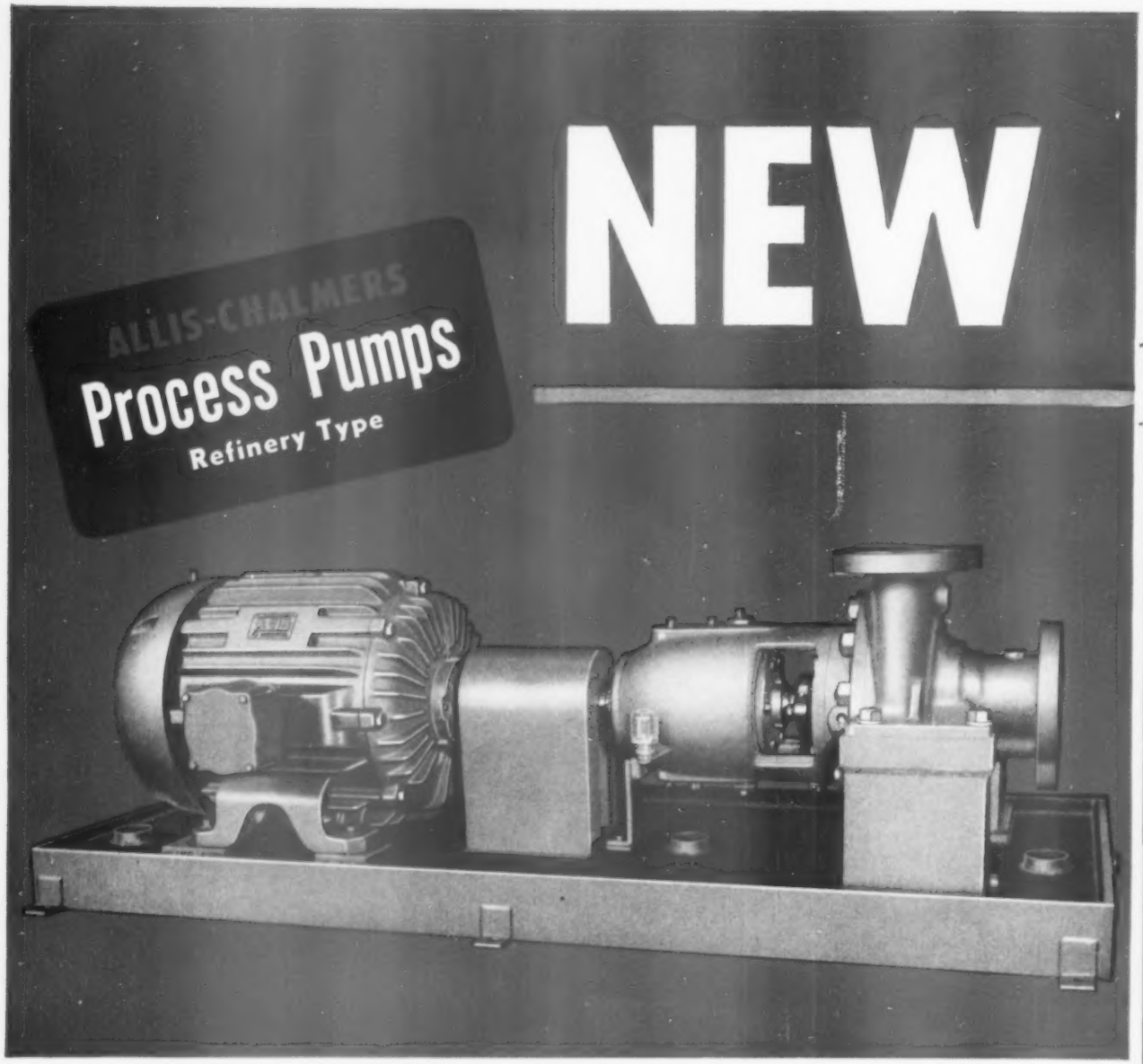
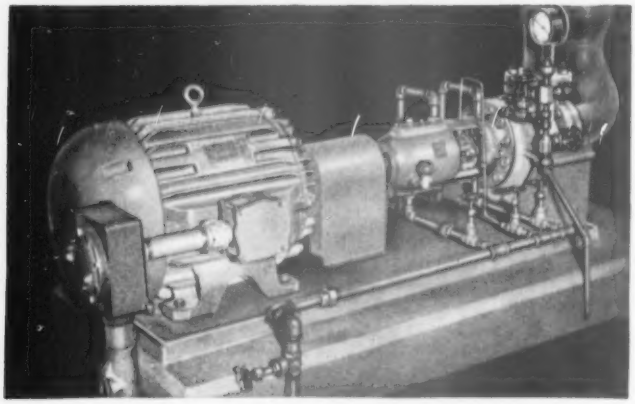
NAME THE DATE... YOUR DEALER WILL DEMONSTRATE



Easy Installation and Maintenance



All Allis-Chalmers Type R pumps are furnished with spacer-type couplings. This type of coupling permits the pump to be disconnected from the driver and the entire rotating element — bearing bracket, shaft and impeller — removed without disturbing either the piping or the driver. This type of assembly permits quick examination of the pump, simplifies repairs or replacements and keeps downtime of the unit to a minimum.

In addition, two sets of bearing bracket assemblies fit the complete range of pump sizes. Since parts for only two sizes of bearing brackets are required, regardless of the number of pumps operated, parts inventories are greatly reduced. All bearing bracket parts of R-9 pumps are interchangeable and all R-12s are interchangeable. Where continuous operation is vital, a complete spare assembly can be kept on hand and replaced very quickly.

Refinery Pump

- ☆ **Specially designed for high temperature operation**
- ☆ **Choice of materials and stuffing box arrangements**
- ☆ **Ample provision for cooling**

HERE IS AN ENTIRELY NEW refinery-type pump. It has every feature designed for continuous trouble-free service and to keep your process pumping costs low.

Sealing Arrangement

When the standard stuffing box is used, it carries an adequate amount of packing plus a seal cage. A mechanical seal is interchangeable with the packing. No machining required. A seal plus auxiliary stuffing box may be installed by simply cutting off the end of the standard stuffing box.

Cooling Methods

The stuffing box is cooled by a water jacket of ample capacity. Further cooling of the packing is provided by in-and-out connections for the sealing oil, which is thus able to act as a coolant as well as a sealing medium. The stuffing box is provided with a water-flushed smothering gland. A second water jacket surrounds the front bearing and the lower part of the oil reservoir. For extremely high temperature operation, a water-cooled pedestal can be supplied.

Throat Bushing

A renewable throat bushing is tack-welded on the pump side of the stuffing box. The close clearance between the bushing and the shaft sleeve cuts infiltration into the stuffing box to a minimum. In case of seal or packing failure, the bushing remains in position and will not blow out.

Wearing Rings

The impeller and casing are both provided with front and rear wearing rings which make it easy and economical to maintain proper clearance. This design also reduces side thrust which in turn reduces shaft deflection and wear.

Double Volute

Double volute design is used in pumps of more than 400 gpm capacity. Forces set up in one volute are counteracted by equal and opposite forces in the other volute. Deflection forces are greatly reduced.

The impeller has low NPSH requirement so that it will successfully handle high volatile liquids at high temperatures.

Centerline Mounting

The pump is mounted at the centerline of the casing. Pipe strains are transmitted directly to the foundation. When proper precautions are taken, alignment of rotating parts will not be affected.

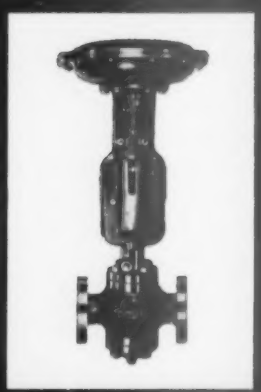
Complete Pumping Unit

Allis-Chalmers can supply a complete pumping unit — pump, motor and control — assembled and ready to install. Coordinated design and manufacture assure undivided responsibility. Call your nearby Allis-Chalmers District Office for help on your next pumping problem. Or write for Bulletin 52B7775. Allis-Chalmers, Milwaukee 1, Wis.

A 4031

ALLIS-CHALMERS

for safe, easy stem lubrication



The isolating valve in the stem lubricator of the Honeywell Series 700 Valve affords maximum safety against leakage when replenishing stem lubricant . . . tight-fitting conical plug and machined seat assure leakless shut-off . . . pinned bonnet prevents accidental removal. The Honeywell Series 700 wide band proportional valve comes in a full range of styles and sizes . . . has *all* the features you look for in a fine valve. Write today for your copy of Bulletin 700-2.

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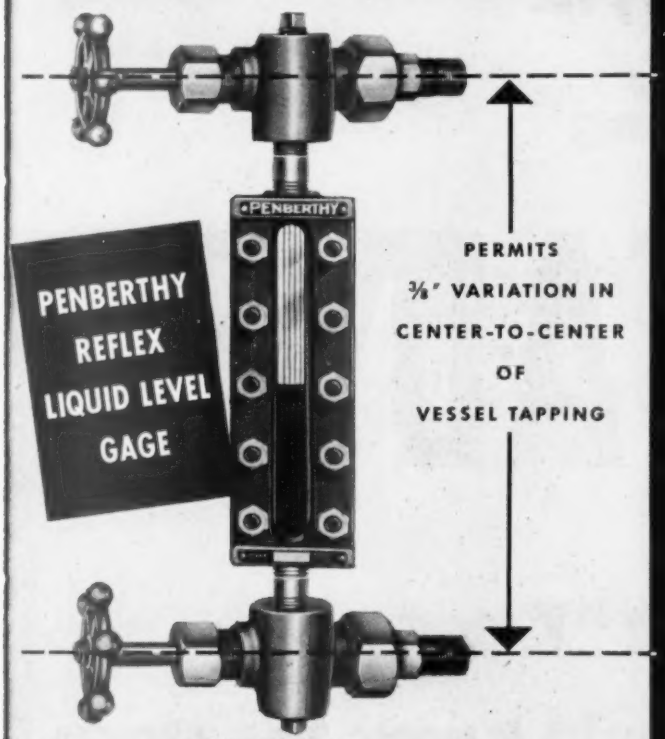
VALVE PRODUCTS

First in Controls



PATENT APPLIED FOR

Another PENBERTHY First

PENBERTHY "Floating Shank"

Saves Time and Money in Gage Installation

A feature available only on Penberthy drop forged steel (and alloy) gage valves, the "floating shank" automatically compensates for as much as ⅜" variation in the center-to-center distance of the vessel tapping. This saves time and cuts the cost of gage installation . . . eliminates stresses often induced during mounting. Penberthy "floating shank" is available at slight additional cost. It will pay you well to specify "floating shank" on your next gage order.

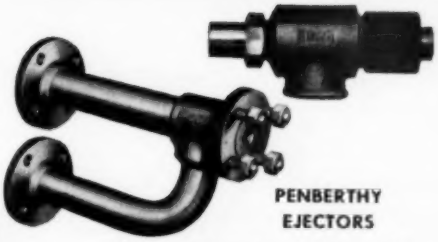
OTHER PENBERTHY PRODUCTS

PENBERTHY TRANSPARENT GAGE

Used to observe color and density of liquids under high pressures and/or temperatures. Exceptionally sturdy construction—liquid chamber machined from solid block of metal. Ask for Catalog 35.

PENBERTHY CYCLING JET PUMPS

Automatically operated by air, gas or steam pressure . . . Will pump without clogging any liquid that will flow through pipes. Ask for Bulletin 5030.



PENBERTHY EJECTORS

A simple jet pump operated by air, water or steam. Needs no lubrication . . . will not get out of order. Made in wide variety of materials and special units developed to meet urusual conditions. Ask for Bulletin 512.

4671

PENBERTHY INJECTOR COMPANY

DIVISION OF THE BUFFALO-ECLIPSE CORPORATION

DETROIT 2, MICHIGAN

Established 1886 — *Canadian Plant, Windsor, Ontario*

In catalytic reforming

It's the **CATALYST**

That's why you should know the story behind the catalyst used in

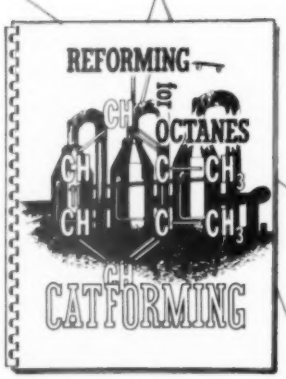
CATFORMING

THAT COUNTS

Many years have gone by since catalytic reforming was first utilized by the petroleum industry. As with many developments, earlier methods fell far short of ideal.

Many years ago Atlantic's engineers and chemists looked well ahead to the more demanding needs of industry-wide commercial application. They devoted themselves to continuous and unrelenting laboratory research. One catalyst after another was rejected for failing to meet Atlantic's projected ideal catalyst. Finally, a catalyst possessing new characteristics and demonstrating an ability to surmount the shortcomings of previously developed catalysts was found. This completely new catalyst, combining the advantages of improved selectivity, greater stability, excellent resistance to poisoning, and easier regeneration, is the heart of CATFORMING.

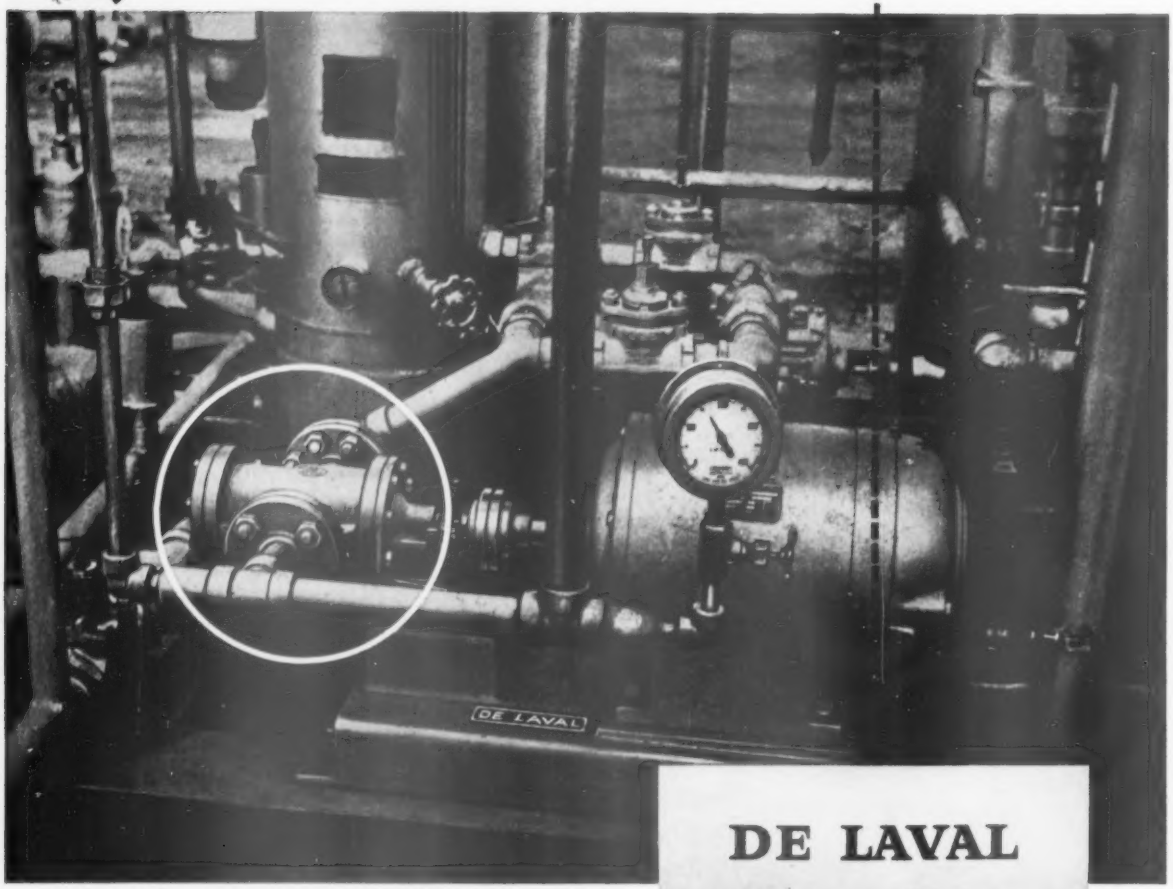
CATFORMING is now in successful commercial operation, furnishing positive proof that IT'S THE CATALYST THAT COUNTS. You are invited to share the many benefits of CATFORMING by joining our ever-growing list of licensees. Call or write for our new detailed bulletin for your introduction to CATFORMING. The Atlantic Refining Company, Research and Development Department, P. O. Box 8138, Philadelphia 1, Pa. (Telephone, Howard 5-2345.)



This detailed bulletin yours for the asking!

ATLANTIC

Versatile pumps for refinery service



De Laval-IMO pump in service in midwest packaged gasoline plant.

DE LAVAL

IMO PUMPS

Today, De Laval-IMO rotary pumps are proving their versatility in dozens of refinery applications. These dependable pumps are being used in refineries and bulk plants to handle viscous fluids including fuel oils, heavy crude oils, lubricating oils and asphalt, as well as the lighter hydrocarbons. For example:

An eastern refinery installed an IMO to pump *viscous* oil at 550 psi. Performance was so satisfactory that three more IMO units were ordered within a few weeks.

A midwest refinery is using De Laval-IMO pumps to handle *asphalt* at 470F at 922 psi and *petrolatum* at 420F and 575 psi.

For a new tank field distribution system, another refinery has 58 direct-connected 1150 to 1750 rpm IMO pumps, handling various oils with viscosities up to 3600 SSU, capacities to 200 gpm and pressures to 150 psi.

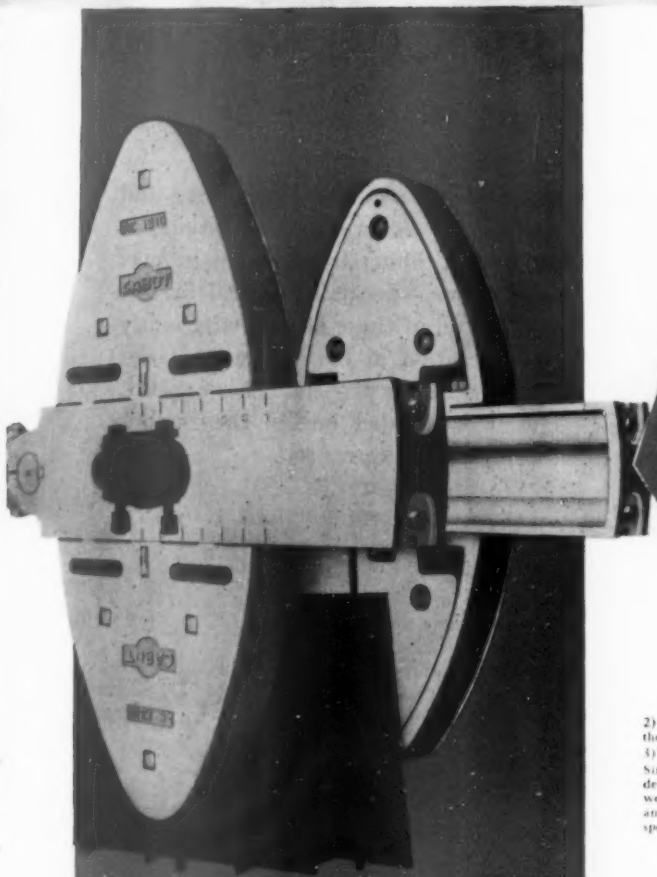
The unique IMO design—*with only three moving parts* — assures long, trouble-free performance. IMO pumps are quiet, pulsation-free, compact and designed for direct-connected high-speed operation. Send for Bulletin LG showing wide range IMO line for capacities to 1,000 gpm at pressures to 509 psi and for capacities to 150 gpm at pressures to 1,500 psi.

DE LAVAL *IMO Pumps*

DE LAVAL STEAM TURBINE COMPANY

810 Nottingham Way, Trenton 2, New Jersey

DL 151



an EASILY adjustable Crank Balanced unit

Adjusting the Cabot Crank Balance is a simple one man operation. It can be done by one man standing on the ground and with the cranks in only one position. No heavy lifting or complicated tools are required. The crank arm is stopped in an approximately horizontal position and the crank adjusted in these three simple steps:

1) Loosen the two lock bolts on each of the weights as shown right.

2) Move the weights to the desired position by turning the adjuster bolt, shown right.

3) Tighten the lock bolts and the job is finished.

Since the weights operate separately, any "lag" or "lead" desired can be readily obtained. Single piece inner weights can be added by simply lifting them into place and securing with three bolts . . . no dismantling or special attachments are required.

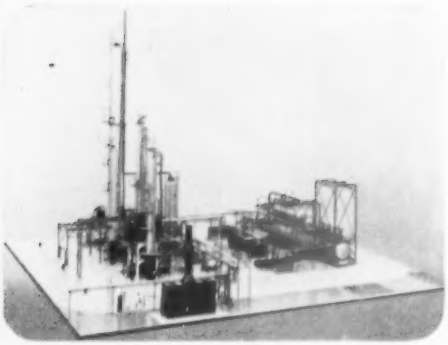
Cabot Adjustable Crank Series gives crank balancing at its best. The Cabot crank is simply constructed and simply operated. Though rarely necessary, assembly and disassembly is so easy that inexperienced mechanics can perform the operation in the field without the aid of blueprints or special instruction. There are few moving parts . . . cutting maintenance time and cost . . . yet it offers complete accuracy and flexibility. The Cabot Adjustable Crank Series has undergone years of tests in the field and proven its ability to give outstanding service under all operating conditions.

CABOT

Write or call your nearby Jones and Laughlin store or representative for more information on the Cabot Crank Balanced Series, or write directly to Cabot Shops, Inc., in Pampa, Texas.

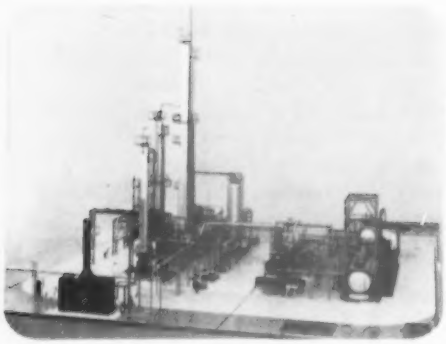
CABOT SHOPS, INC. **PAMPA, TEXAS**

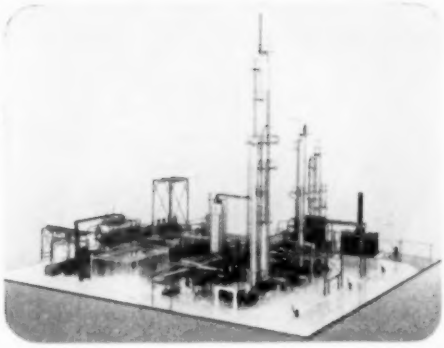
Look at it from



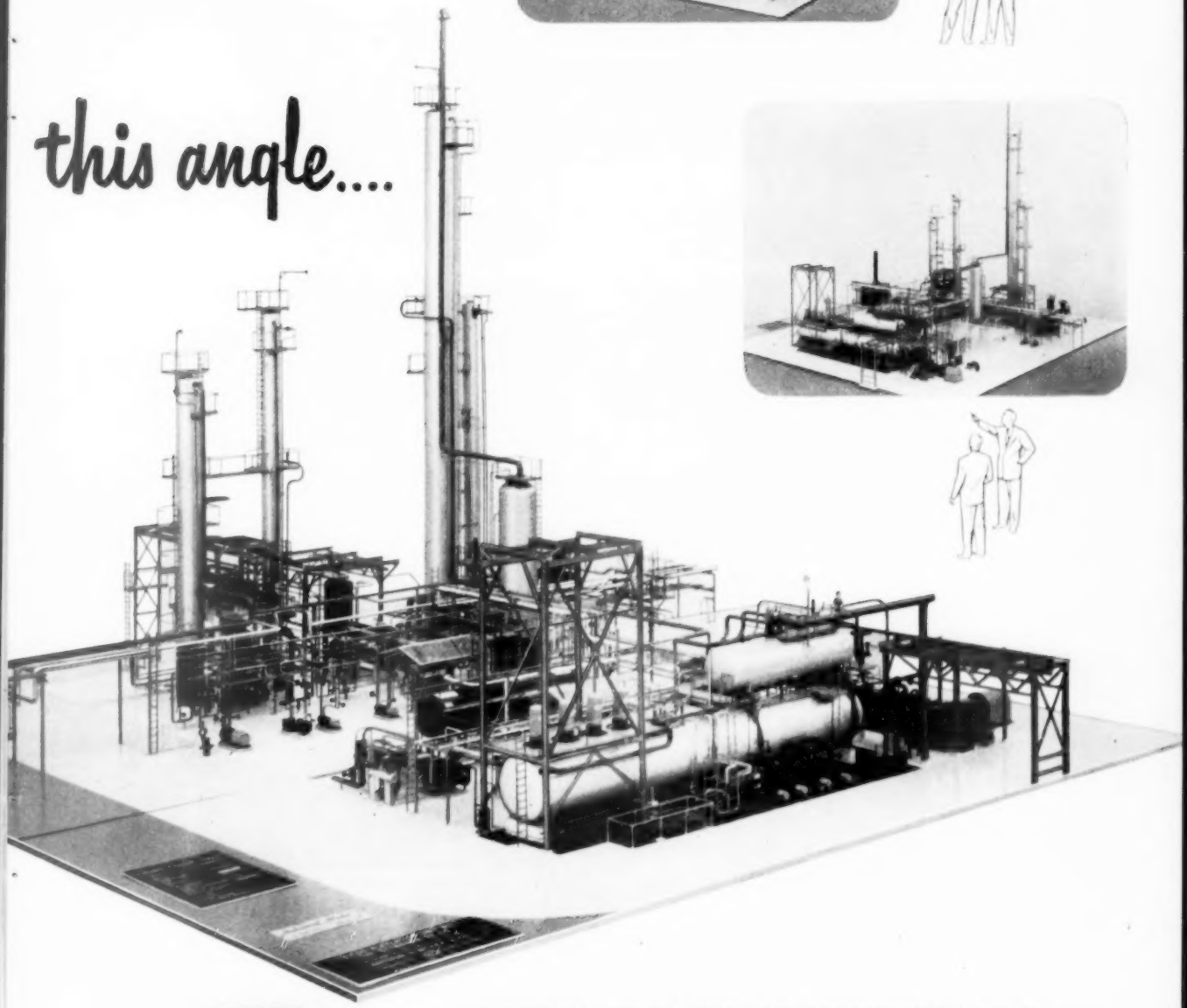
...or from any angle. It's McKee engineering and it will withstand the closest scrutiny from any point of view—plant layout, piping arrangement, safety, efficiency, maintenance, operation, capital investment. McKee takes all of these factors, and many others, into consideration in the design and construction of your refinery project. This careful, thorough planning is another one of the reasons *McKee engineering means assured results.*

Scale Models like this, built from engineering drawings, allow you to study your complete plant from every angle. They aid us in checking engineering and purchasing, help speed up construction and are valuable in training operating crews. The one shown here is a model of one of four alkylation units now in progress by McKee at Toledo, Ohio, Wood River, Illinois, Norco, Louisiana and Texas City, Texas.





this angle....



ENGINEERING, PURCHASING AND CONSTRUCTION FOR THE PETROLEUM REFINING AND IRON AND STEEL INDUSTRIES

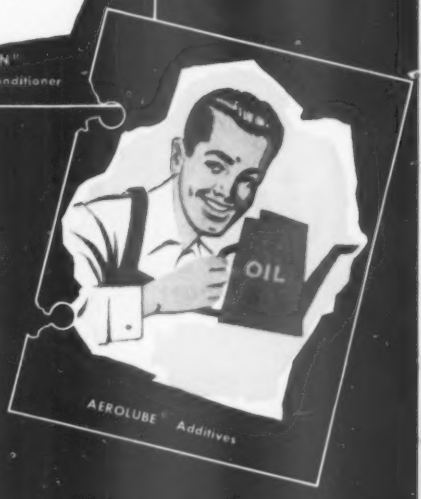
Arthur G. McKee & Company • Established 1905

Headquarters: McKee Building, 2300 Chester Avenue, Cleveland 1, Ohio.
Offices: New York • Tulsa, Oklahoma • Union, New Jersey • Washington, D. C.
British representatives of Metals Division: Head, Wrightson & Company, Ltd.
Canada: **Arthur G. McKee & Company of Canada, Ltd., 350 Bay St., Toronto 1, Ont.**

AEROCAT® MS Synthetic Fluid Cracking Catalysts

Specialty Catalysts

AEROPAN® Drilling Mud Conditioner



AEROLUBE® Additives

depend on CYANAMID service

to meet your chemical requirements

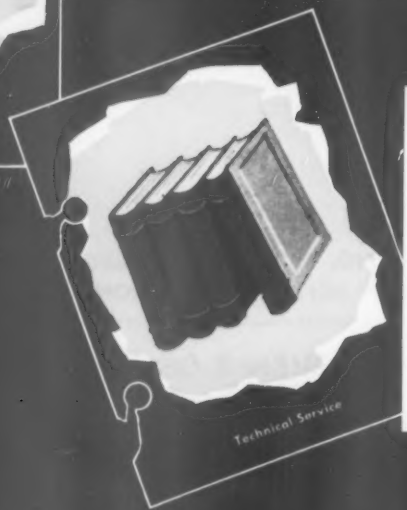
An important part of Cyanamid's integrated service to the petroleum industry is its ability to meet the chemical requirements of the industry's every phase.

Cyanamid Chemicals range from drilling mud conditioners to specialty catalysts and lube oil additives. Each is the result of continuing basic research by Cyanamid's Refinery Chemicals Department — and of the knowledge gained in the field by Cyanamid's specialists.

Cyanamid Chemicals today are contributing to the improvement of many types of petroleum products.

One example: Cyanamid Gelling Agents for the lubricating grease manufacturer embody the latest advances in scientific research, among which is greatly improved gel stability obtained by replacement of a small part of the stearic acid with dimer acid. Standard ASTM and SOD tests also show improved yield and resistance to mechanical breakdown of aluminum greases produced with these new gelling agents.

Gelling Agents



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AMERICAN Cyanamid COMPANY

REFINERY CHEMICALS DEPARTMENT, DIV. OG-6
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Again!

Gas Pulsation Prevented

by

BURGESS-MANNING SNUBBERS

THESE OUTSTANDING COMPANIES PLACED THEIR CONFIDENCE IN BURGESS-MANNING

Oklahoma Natural Gas Company
Continental Oil Company
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Aurora Gasoline Company
Pacific Gas & Electric Company
Union Oil Company of California

BURGESS-MANNING

☑ ENGINEERING
☑ DESIGN
☑ KNOW-HOW
for
☑ Best Performance in Operation

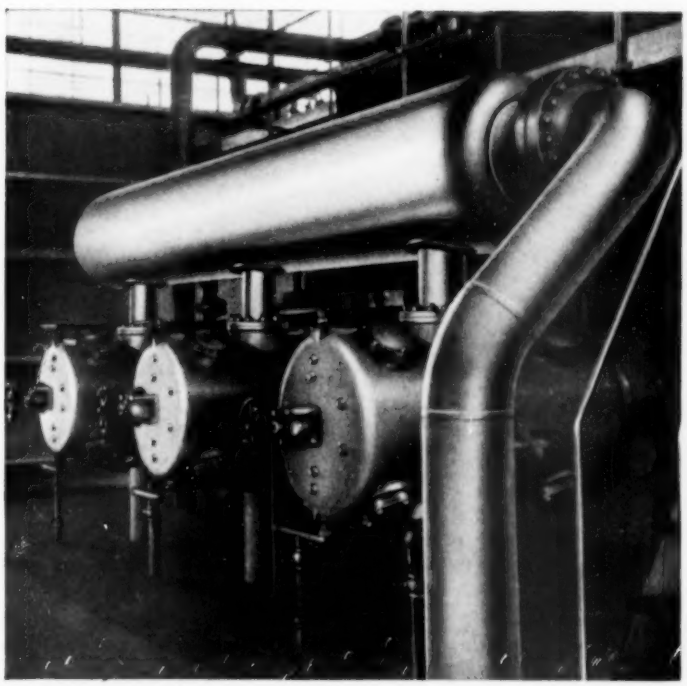
Individually engineered and designed Burgess-Manning Snubbers effectively control pulsation in gas and air piping excited by compressors, blowers, or reciprocating pumps. Pulsation control prevents line vibration and equipment fatigue with improved gas flow.

Smoother gas flow allows for best efficiency,
process action,
gas transmission,
and gas measurement.

We invite you to write for your copy of an actual field report in survey and analysis of surge control with Burgess-Manning Pulsation Snubbers.

PACIFIC GAS & ELECTRIC COMPANY

Burgess-Manning Pulsation Snubbers installed on a gas compressor in the Topock Station of Pacific Gas & Electric Company



BURGESS-MANNING COMPANY

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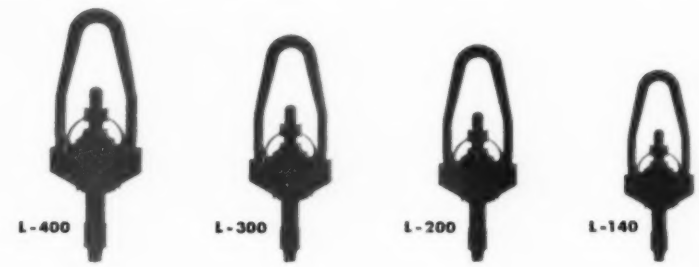
1203 DRAGON STREET
Dallas, Texas

CHICAGO, ILLINOIS • LIBERTYVILLE, ILLINOIS • REPRESENTATIVES: HOUSTON • TULSA • LOS ANGELES • ST. LOUIS • NEW YORK

EMSCO OFFERS NEW LINE OF SWIVELS... FOR SHALLOW TO DEEPEST DRILLING



Emsco's new L Series Swivels are identical in design and differ only in capacity. Each of the four swivels—L-140, L-200, L-300 and L-400—has the same features. The model number indicates the swivel's dead load capacity in tons.

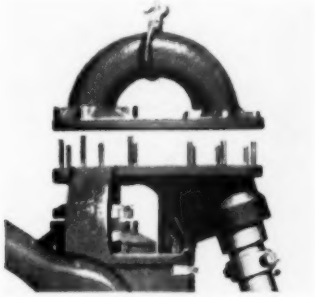
Weight of the L Series Swivels has been materially reduced over that of former models of like capacity. Height has been lowered and hook clearance increased.

Each of the swivels has the platform-mounted gooseneck that permits the washpipe and packing to be removed without disconnecting the rotary hose. And each is equipped with Emsco's *exclusive* time-saving, long-wearing, one-piece washpipe cartridge packing.

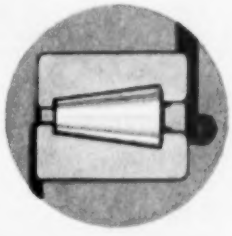
Other features include high capacity main bearing, replaceable bail pins, replaceable sub and low center of gravity.

Call CONTINENTAL for details about these improved, rugged and highly economical swivels.

Emsco's exclusive one-piece cartridge washpipe packing is made of five lip-type sealing rings. The top serves as a grease seal. Bottom four rings seal against highest mud pressures. Only one of the soft, flexible rings is in contact with the washpipe at a time. As each lip wears the sealing function passes to the next higher lip.



Platform-mounted gooseneck. Designed for L Series Swivels, the new gooseneck permits the top to be lifted off without disturbing the rotary hose connection. Thus time required to replace washpipe and packing is reduced. Sturdy construction of the gooseneck platform prevents misalignment of the washpipe.



Main bearing of the L Series Swivel is a high-capacity, true-cone roller bearing, designed for heavy-duty service. It is rigidly supported by the heavy ribbed body of the swivel. An adjustable radial thrust upper sleeve bearing makes adjustment of main bearing possible without going into body of the swivel.

ENGINEERED AND BUILT BY EMSCO—SOLD BY CONTINENTAL

EMSCO

EMSCO MANUFACTURING COMPANY

Houston, Tex. · LOS ANGELES, CALIF. · Garland, Tex.

CONTINENTAL

"SERVING THE OIL AND GAS INDUSTRIES"

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Export Div.: The Continental Supply Co., Inc., 30 Rockefeller Plaza, New York, N. Y.
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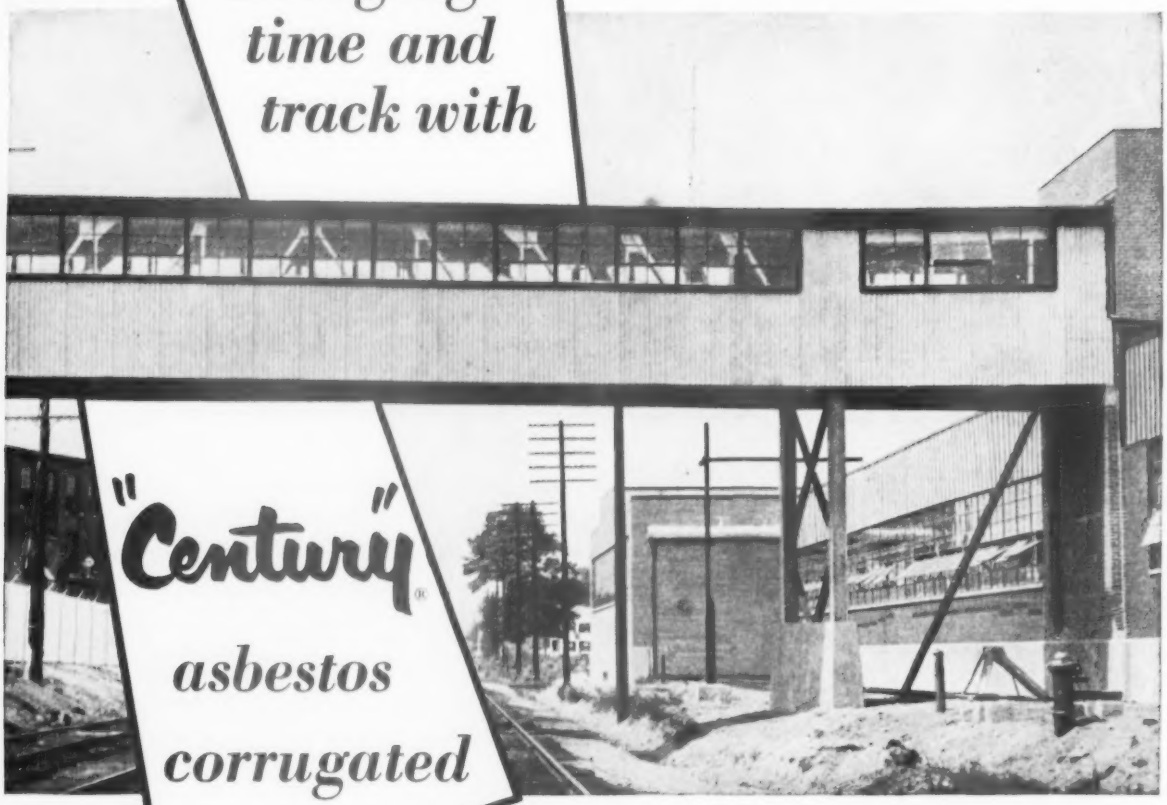
Representatives: Argentina, Bolivia, Brazil, Chile, Colombia, England, Ecuador, Peru, Trinidad, Uruguay, Venezuela

E 140

Bridging time and track with



"Century"® asbestos corrugated

Inter-plant bridge of the Trumbull Electric Department of the General Electric Co. in Plainville, Conn. Sidewalls of bridge and the building on the right constructed of "Century" Asbestos Corrugated, and applied by Hampden Cornice Works Inc., Springfield, Mass. Supervisor of Construction: General Electric Realty Corp., Schenectady, N.Y. Engineer and Architect: Lockwood Greene Engineers Inc., New York, N.Y. General Contractor: The Gellatly Construction Co., Bridgeport, Conn.

"Century" Asbestos Corrugated makes an ideal siding for this new inter-plant bridge and building because of its outstanding durability and freedom from maintenance. After many years this long-lived siding will still be sound, serviceable, and weather-tight.

If that's the kind of dependable siding and roofing *you* are seeking, you ought to know more of the many advantages in using "Century" Asbestos Corrugated. Here are a few facts about this versatile, economical material:

It is made in large, strong sheets from portland cement and asbestos fiber—therefore *cannot* burn, rot or rust. It is impervious to rodents and termites. It is completely, permanently weatherproof. Although it never needs paint, it will take decorative colors well.

"Century" Asbestos Corrugated has proved itself to be a maintenance-free and long-lasting building material—well worth your close consideration. We shall gladly send you complete information on request.

Nature made Asbestos . . .
Keasbey & Mattison has made it serve mankind since 1873.

K&M Best in asbestos ®

KEASBEY & MATTISON
COMPANY • AMBLER • PENNSYLVANIA

Before you buy:

CHECK SERVICE RECORDS!

Two rugged LS-85's, delivering 92 net hp each, speed a pipelining job by cleaning out a caved ditch near Many, La.

Quality construction slashes maintenance costs . . . matchless service minimizes downtime

WHAT OWNERS AND OPERATORS SAY ABOUT LINK-BELT SPEEDERS . . .

OWNER—"Only service in 18 months was two sets of cable, minor dipper repairs."

OWNER—". . . really fine distributor service."

OWNER—"My Link-Belt Speeder not only replaced two smaller rigs, but cost only $115 for service in five seasons!"

OPERATOR—"Running it over two years with no downtime."

OWNER—"Best dollars I ever spent . . ."

OPERATOR—". . . easy access for service. Self-cleaning crawler treads are really good!"

OPERATOR—"Only one clutch adjustment in eight months!"

WITH a Link-Belt Speeder, you're sure to get maximum production at minimum cost—not only for this season . . . *but for many seasons to come!* Also, with Link-Belt Speeder's world-wide factory-trained distributor service, you can be sure of prompt, expert service or parts replacement when you need them.

What's more, in every area there is a Link-Belt Speeder resident service engineer. It's his job to be acquainted with you and your particular problems.

If you'd like more information about the most complete line of crawler, wheel or truck-mounted shovel-cranes write for Catalog 2373.

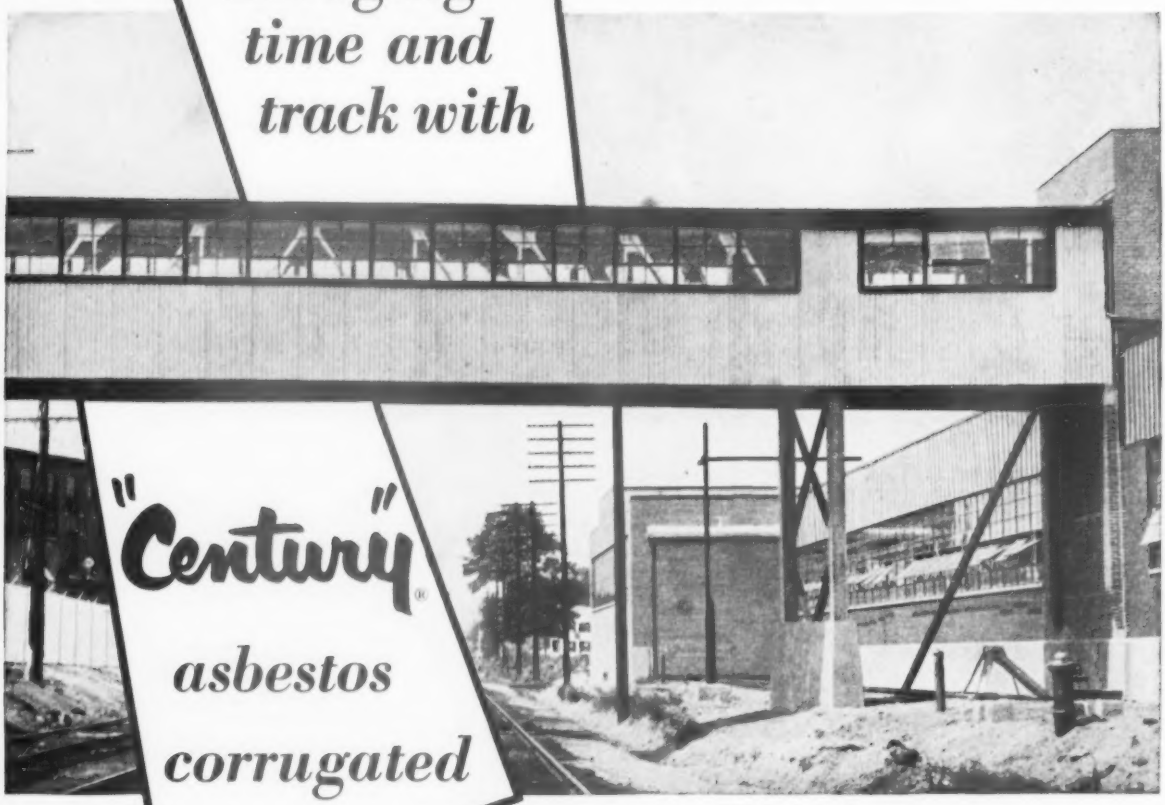
LINK-BELT SPEEDER CORPORATION
Cedar Rapids, Iowa

13,082

LINK-BELT SPEEDER
CORPORATION
BUILDERS OF A COMPLETE LINE OF CRAWLER, TRUCK AND WHEEL-MOUNTED SHOVEL-CRANES

FACTORY-TRAINED DISTRIBUTOR SALES AND SERVICE SPECIALISTS ...EVERYWHERE

Bridging time and track with



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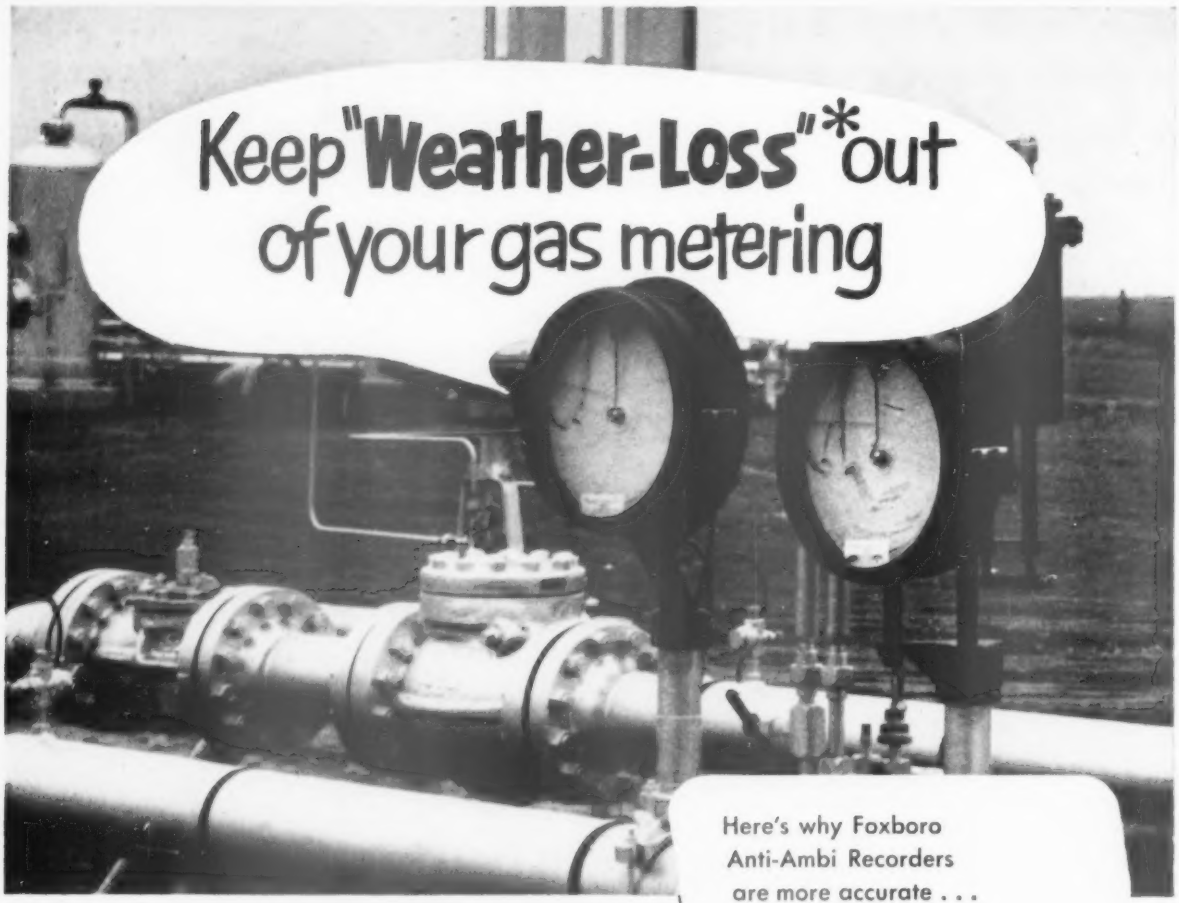
BUILDERS OF A COMPLETE LINE OF CRAWLER, TRUCK AND WHEEL-MOUNTED SHOVEL-CRANES

FACTORY-TRAINED DISTRIBUTOR SALES AND SERVICE SPECIALISTS . . . *EVERYWHERE*



Keep "Weather-Loss"* out of your gas metering

*Weather-loss is the error in metered gas volume caused by temperature variations. Unless corrected, a variation of 10° F. in gas temperature will cause an error of 1% in metered volume. And that can mean big money losses from season to season. With Foxboro Anti-Ambi Temperature Recorders in your line you eliminate these errors . . . you can compute *actual* gas delivery, regardless of weather conditions.

Like all other Foxboro Instruments, Anti-Ambi Recorders are ruggedly built for accurate, trouble-free performance year after year. Weather-tight case allows outdoor installation. Write for complete information.

The Foxboro Company,
606 Neponset Ave.,
Foxboro, Mass., U.S.A.

Here's why Foxboro Anti-Ambi Recorders are more accurate . . .

This diagram shows the Foxboro automatic compensation for ambient temperatures. Measuring and compensating elements are located in the same case, and capillaries for both systems are in the same protective tubing. Compensating system (B) continuously corrects the primary measuring system (A) for ambient temperature changes.

Here's the small-diameter, quick-response bulb used with the Foxboro Anti-Ambi Thermometer. Bulb is made with a stainless steel neck to reduce conduction effects.

The bulb is generally protected by the special socket shown above. It has aluminum fins for rapid heat transfer, and a stainless steel extension to minimize heat conduction to the socket head.

FOXBORO REG. U. S. PAT. OFF.

Anti-Ambi THERMOMETERS

FACTORIES IN THE UNITED STATES, CANADA AND ENGLAND

LOOK TO a.c.f. FOR

SAFER STORAGE
of Anhydrous Ammonia

The superior safety factor of these 30,000 gallon A.C.F.-built storage tanks allows distributors of the miracle fertilizer (anhydrous ammonia) to get closer to their fast expanding markets. This installation for Suburban Farm Service, Delmar, Md.

...AND FOR QUALITY that protects your investment...shares your responsibility for public safety...gives you a far greater choice of locations. With A.C.F. products you enjoy a margin of safety that far exceeds the requirements of both public and private regulating bodies.

Advances made by A.C.F. technicians, researchers and craftsmen in both fabrication and inspection may well lift worry and unnecessary risks from your operations. Ask your nearest A.C.F. Representative about these developments today. American Car and Foundry Company, New York
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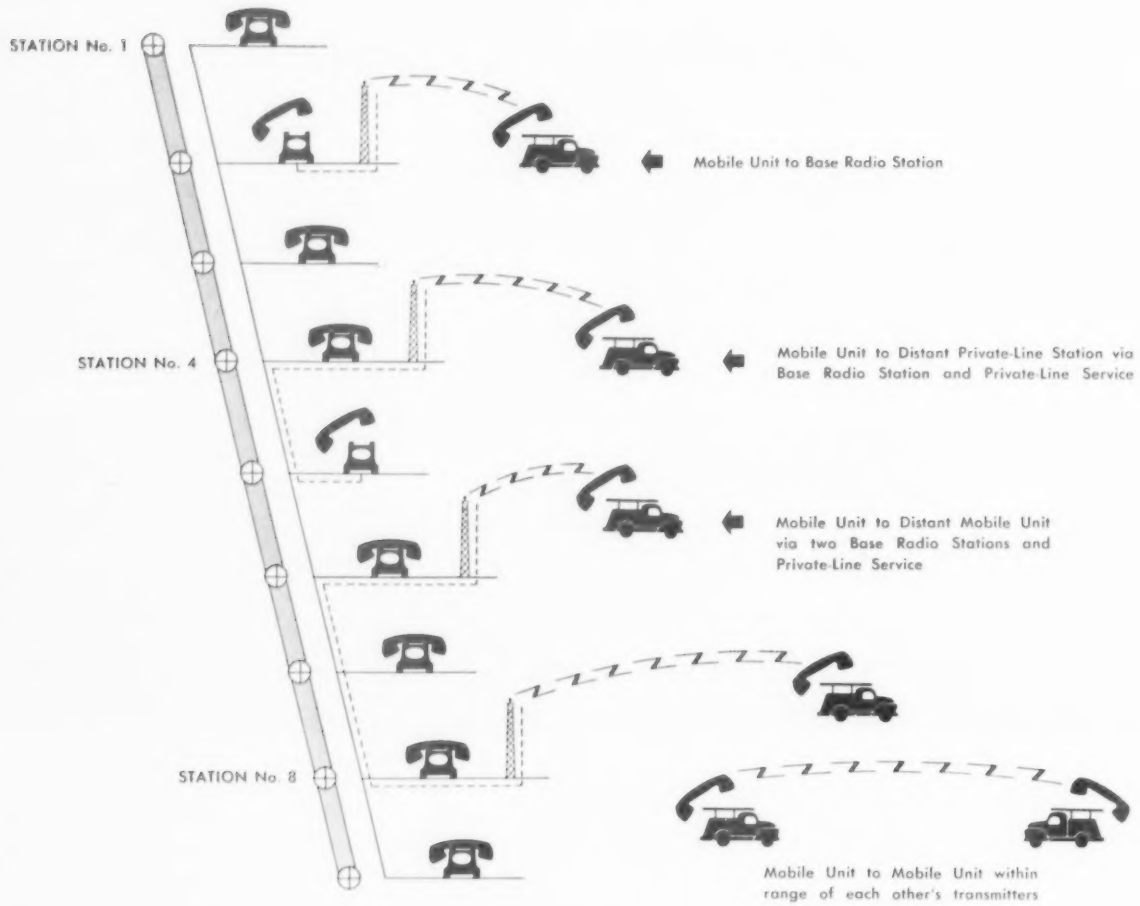
BELL SYSTEM COMMUNICATIONS

for flexibility all along the line


STATION No. 1
STATION No. 4
STATION No. 8
Mobile Unit to Base Radio Station
Mobile Unit to Distant Private-Line Station via Base Radio Station and Private-Line Service
Mobile Unit to Distant Mobile Unit via two Base Radio Stations and Private-Line Service
Mobile Unit to Mobile Unit within range of each other's transmitters

With integrated mobile radio and private-line telephone service, this Bell System setup is adaptable to many requirements.

Of course, this layout may not fit your particular needs. But Bell System engineers can design one that will. They'll study your operations, then tailor a system to your special requirements.

For Bell System communications you pay a fixed monthly charge—which is complete. It includes continuous maintenance, resources to meet emergencies . . . all the "extras" that would otherwise be your responsibility and expense.

Your Bell Telephone Company will be glad to study your communications problems and needs without charge.

PRIVATE-LINE TELEPHONE

TELETYPEWRITER

MOBILE TELEPHONE

METERING CHANNELS

BELL TELEPHONE SYSTEM

Four things line pipe men should remember: When you specify

steel line pipe, always remember these four essential requirements:

1 Remember uniform quality. You are sure of this with Kaiser Steel line pipe, because it's produced by fully-integrated facilities, completely controlled at every step of production, rigidly tested before it's approved.

2 Remember dependable delivery. This is assured by Kaiser Steel in the western two-thirds of the United States. Every operation can be geared to meet your schedules *without* delay, because Kaiser Steel performs every step in pipe making, from raw materials mining to finished pipe fabrication.

3 Remember prompt service. Kaiser Steel men with long experience in working with the gas and oil industries stand ready to serve you whenever you say the word.

4 Remember wide range of sizes. Kaiser Steel pipe is produced in types and sizes to meet practically every requirement for petroleum, gas and water transmission.

It's good business to do business with

Kaiser Steel

KAISER STEEL PIPE SPECIFICATIONS • All pipe manufactured to latest A.S.T.M. and A.P.I. specifications

Type	Diameter	Length	Wall Thickness	Shipping Point
Continuous Weld—Threaded and Coupled	½" to 4" nominal I.D.	Uniform 21'	Standard	Fontana, Calif.
Continuous Weld—Plain End	2⅜" to 4½" O.D.	Up to 40'	Standard	Fontana, Calif.
Electric Resistance and Fusion Weld—Plain End	14" to 18" O.D.	Up to 40'	.250" to .500"	Napa, Calif.—Basalt-Kaiser
Electric Resistance Weld—Plain End	5⅛" to 12¾" O.D.	Up to 55'	.188" to .375"	Fontana, Calif.
Electric Fusion Weld—Expanded—Plain End	20" to 30" O.D.	Up to 40'	.250" to .500"	Napa, Calif.—Basalt-Kaiser

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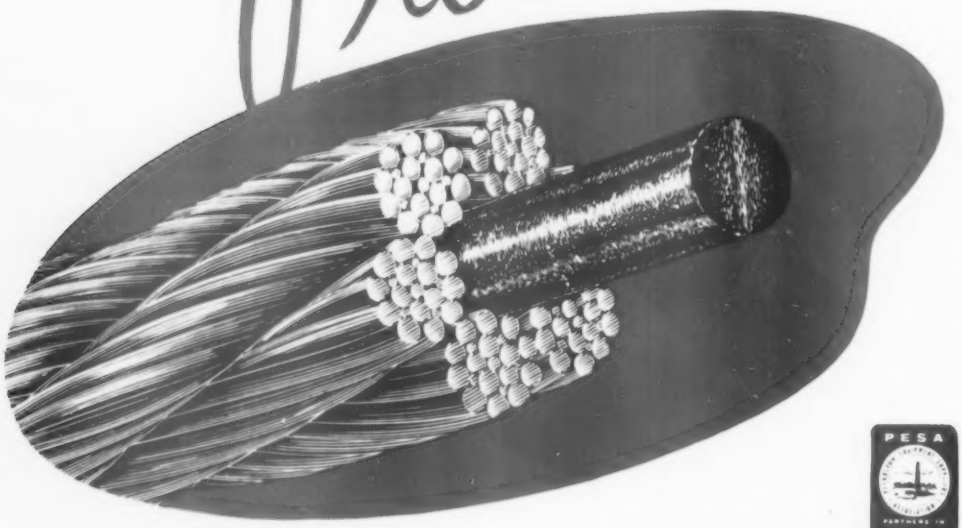

J&L's PLASTIC-CORE

The wire rope designed for cable tool drilling

1. — *Absorbs no moisture or acid to corrode the strands.*
2. — *Sets up no friction to cause internal wear.*
3. — *Cushions firmly; no distortion, ever.*
4. — *Flexible; the rope handles beautifully.*
5. — *Uniform, and stays that way.*
6. — *A premium product, an engineering triumph, at no extra cost to you.*

The new PLASTIC-CORE has been field-tested under the most trying conditions. Phone your J&L store NOW for more information — for the exciting details about what it will do for you. Ask to see samples.

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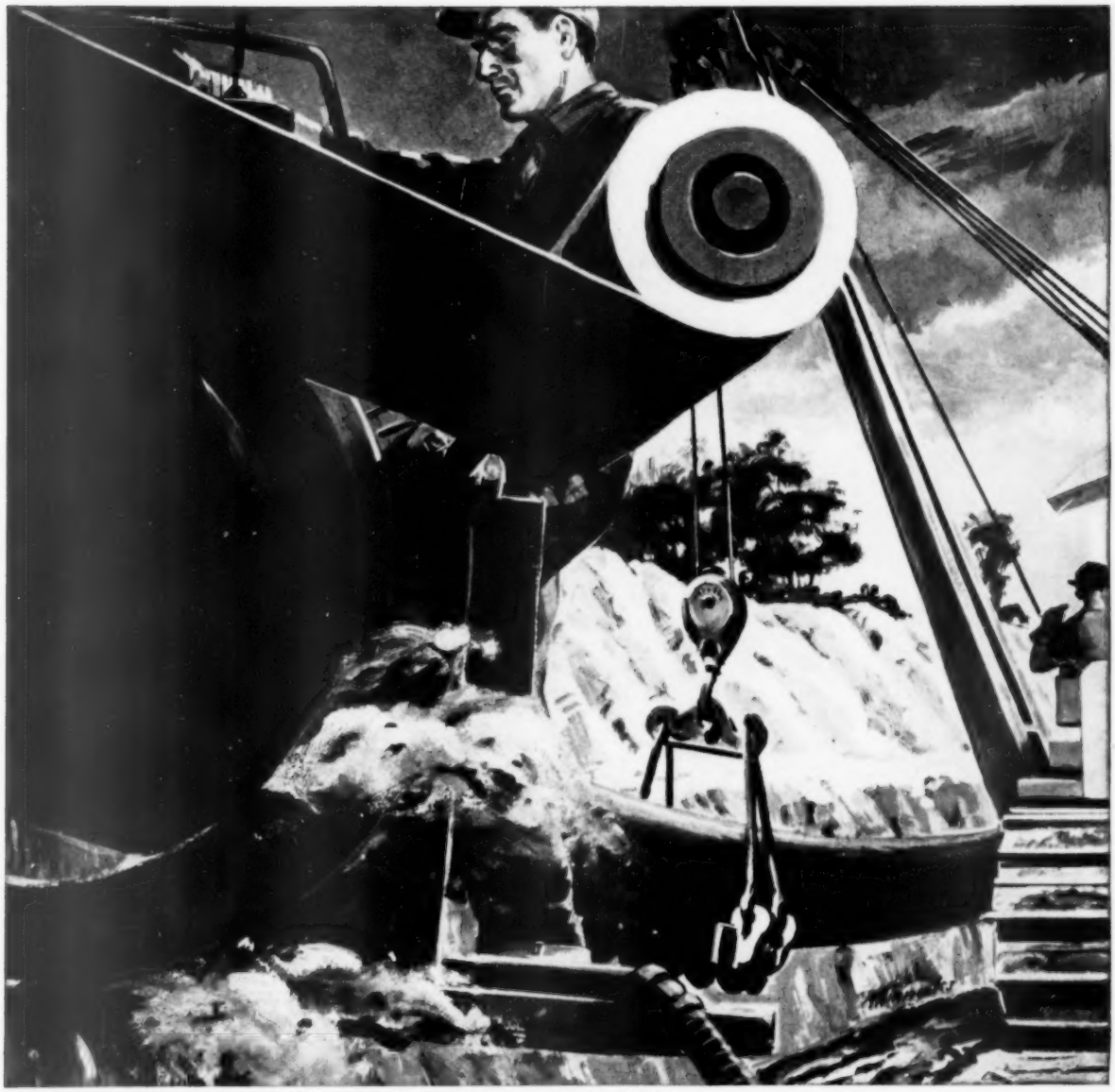

TEMPERA PAINTING BY JAMES MINNICKS ESPECIALLY FOR BARRETT DIVISION

Wrapping up the job

This scene, with the circling arms of the wrapping machine busily binding pipe with a tarred felt wrapper, is familiar to pipeliners. And members of Barrett's Technical Service Corps are an important part of the picture.

These trained men are paid by Barrett to work with **you!** They start when your pipeline job is in the planning stage, helping to determine the best protective coating to meet your specific needs and requirements. Therefore, you are assured in advance that costly pipe will **get** superior protection — to **give** longer service.

And Barrett field inspectors are at your pipeline site whenever needed. The proper application of coal-tar enamels is vital—and a Barrett inspector's advice and supervisory experience can save you time and money. It is for this service that Barrett maintains field offices throughout the country.

For the best in pipe protection, at lowest cost . . . Specify Barrett — from **start** to **finish!**

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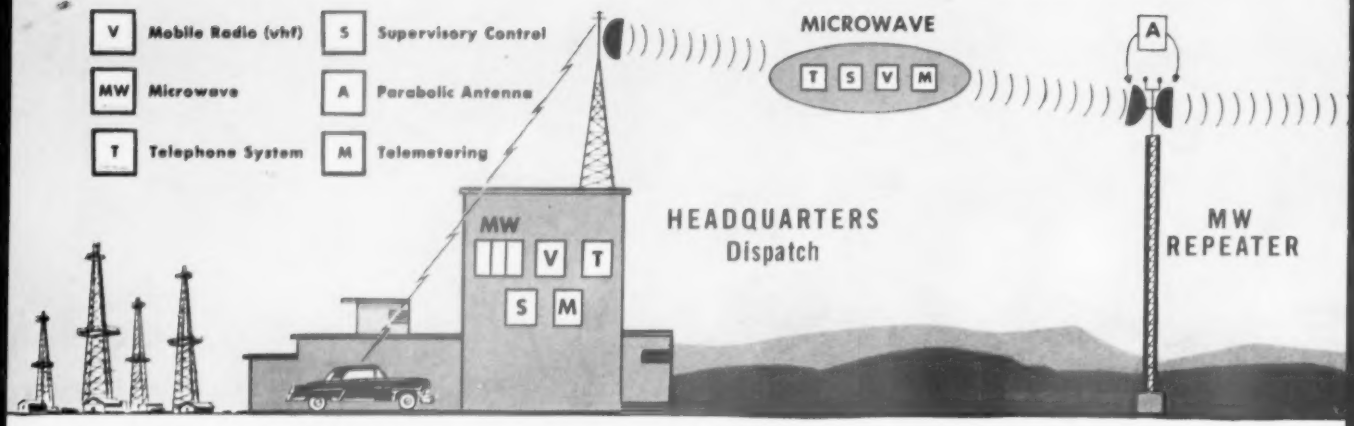
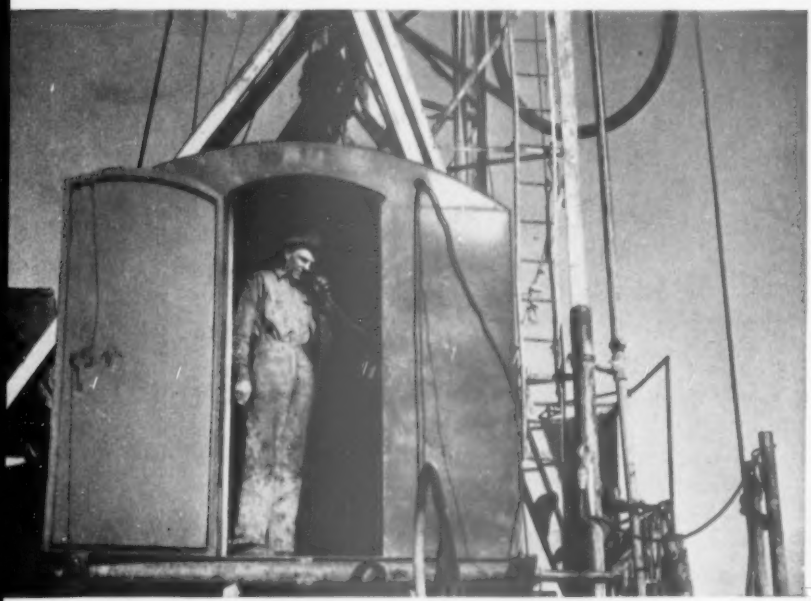


From Drilling . . .

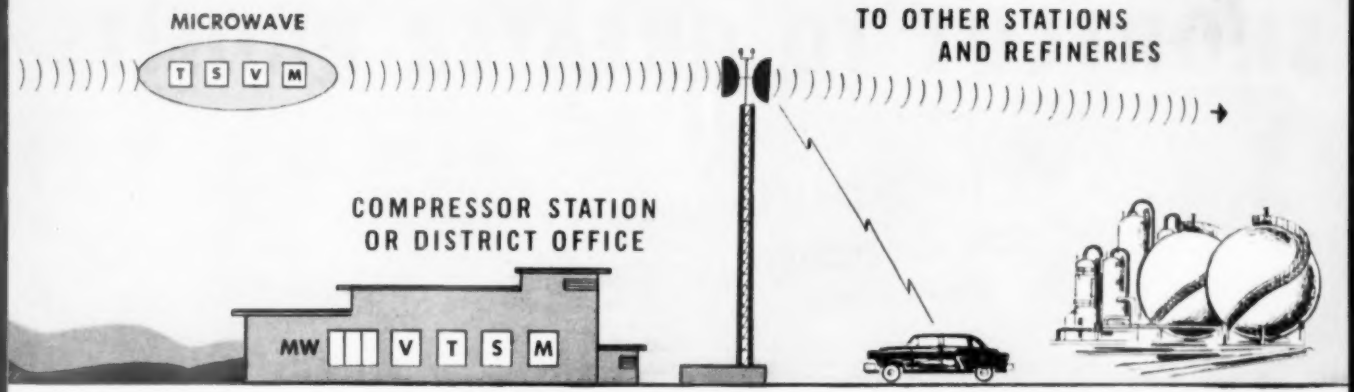
Photo courtesy The Oil & Gas Journal

AT A REFINERY it takes this equipment plus G-E 2-way radio supervision to handle plant-wide construction, maintenance, and machinery moving with minimum delay.



A SUPERVISOR—ON EVERY RIG! Barrel output has actually been doubled by many companies who use General Electric 2-way radio for instant instructions, to order supplies and to eliminate long, expensive breakdowns!

PIPELINE INSTALLATION—MADE EASY! G-E 2-way coordinates the work of all crews . . . makes precisely-timed assembly possible. *Push Button Control* with a G-E system maintains the line!



to Pipeline . . . to Refinery Operations . . .

G. E. OFFERS YOU A COMPLETE COMMUNICATIONS PACKAGE!

**FOLLOW THE OIL INDUSTRY LEADERS—
PLAN YOUR NEXT JOB WITH
COMPLETE G-E COMMUNICATIONS**

A major reason behind today's record petroleum production with minimum new equipment is the increasingly important effect good communications has on nearly every operation. And, most oil industry leaders have discovered that *the best way* to lower costs . . . increase volume *is with General Electric communications!* G-E 2-way radio, microwave, telemetering, and tone system supervisory equipment are daily depended on to coordinate drilling activities and make them safer . . . to chart and perfectly time the flow of oil to refineries with *push button control* over every mile . . . to expedite ultimate delivery at points of consumption throughout the nation!

Before you buy or replace any communications equipment, investigate G-E! Get a *complete G-E package* that fits all your needs plus *two-way economy!* Low initial cost and minimum maintenance are economy factors you'll appreciate! Remember, every G-E installation, regardless of size, is custom-engineered to combine rugged service with always dependable performance. Call the CAS* man at a local G-E office *today.* Or, write: *Section 863-8, General Electric Company, Electronics Park, Syracuse, New York.*

*Communications Advisory Service

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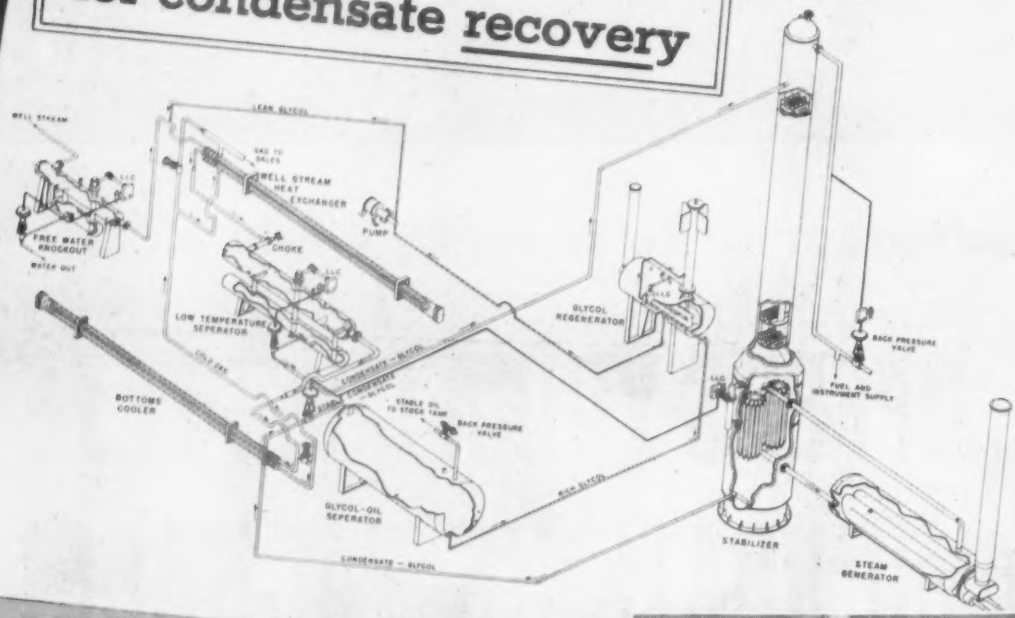
SHORTCUT TO GREATER PROFITS

A complete plan for condensate recovery



BS&B Glycol Injection System OF LOW TEMPERATURE SEPARATION with Stabilizer*

Typical installation... BS&B Glycol Injection System of Low Temperature Separation With Stabilizer.

Tests of BS&B equipment show that operators using it are up to 50 percent ahead, when it comes to recovery, over using old style separation equipment. One operator (name and detail test data on request) is making $161.06 more per day. This greater recovery, with the incomparable BS&B Glycol Injection System with Stabilizer, results because it works two ways: (1) *extracts more* liquid hydrocarbons, (2) *holds on to more* hydrocarbons. What's more, it produces a gas dehydrated to pipeline specifications. The BS&B representative near you will tell you what the BS&B equipment will cost in your special case. Call him or write.

* Patented and Patents Pending

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per day increased recovery over standard 2-stage operation

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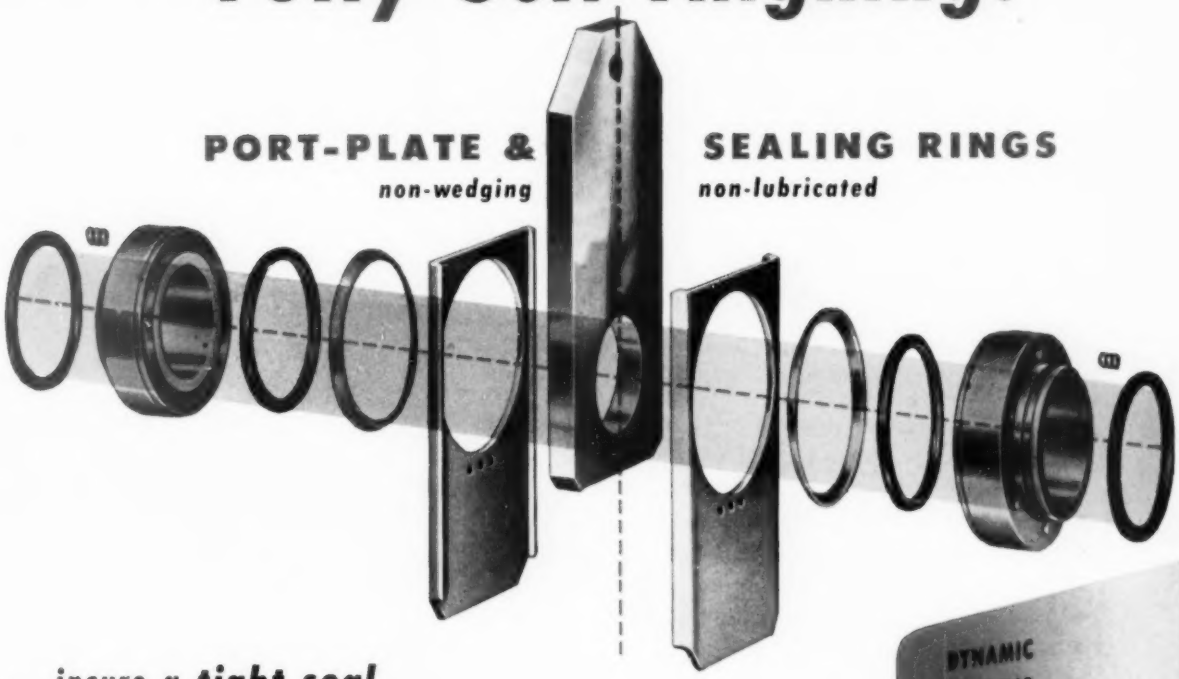
GROVE SEAL-"O"-RING GATE VALVES

Fully Self-Aligning!

PORT-PLATE & *non-wedging* **SEALING RINGS** *non-lubricated*



...insure a tight seal and easy operation

Free floating port-plate and seat rings of Grove Seal "O" Ring Gate Valves insure positive alignment at all times. Smooth sliding operation of port-plate requires much less torque, opening and closing than any other type gate valve. Dead-tight seal is effected by metal-to-metal seating augmented by flexibly resilient "O" Rings. The greater the line pressure the greater the seal. Get full details today.

Write for New Grove Seal "O" Ring engineering bulletin No. G 53.

DYNAMIC FEATURES

- DUAL SEALING
- NON-WEDGING
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- SQUEEGEE WIPING
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- REVERSIBLE FLOW
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- MINIMUM MAINTENANCE
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- SMOOTH OPERATING
- NON-LUBRICATED

GROVE SEAL-"O"-RING GATE VALVES
THRU PORT CONDUIT TYPE

GROVE REGULATOR COMPANY · 65th & Hollis Sts., Oakland 8, Calif.
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GROVE SEAL-"O"-RING GATE VALVE

IDEAL HOOK BLOCKS

. . . *built for safety and more efficient derrick floor handling*

Keeping pace with oil-country needs in production and drilling equipment has been one of the important rules of operation throughout National Supply's fifty-nine year history of service to the petroleum industry.

As an example of meeting the needs in drilling operations, National Supply's new line of IDEAL Hook Blocks incorporates greater load capacity with minimum overall length for operating space economy and flexibility. Thoroughly field-tested and proven, the IDEAL Line of Hook Blocks brings these important design features to virtually every drilling job:

- Sheaves independently mounted on tapered roller bearings
- Individual lubrication to each sheave bearing
- All parts securely locked for safety
- Streamlined—nuts, bolts, pins and fittings completely recessed
- Shot peened alloy steel shank springs
- Hook body mounted on tapered roller thrust bearing
- Elevator link supports equipped with positive retaining links
- Automatic-latching hook tongue cannot be accidentally opened
- Spring-actuated 8-position rotation lock
- Grooved hook body facilitates elevator alignment with drill pipe

Other features and engineering specifications are covered in new bulletins on IDEAL Type "E" and Type "F" Hook Blocks. Write for your copies today.

THE NATIONAL SUPPLY COMPANY

PITTSBURGH 30, PENNSYLVANIA

DIVISION OFFICES: Denver; Ft. Worth; Houston; Pittsburgh; Tulsa; Torrance

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NEW HEAVY DUTY IDEAL TYPE "F" HOOK BLOCKS

Representing the accumulated results of continuing oil-country experience and advanced hook block engineering design, the new IDEAL Type "F" Hook Block provides the extra load capacity and ruggedness needed in today's deep drilling. Available in both 300 ton and 450 ton ratings, the new IDEAL Type "F" Hook Blocks carry the safety and fast handling features built into all of National's line of IDEAL Hook Blocks.

"TYPE 548F300"

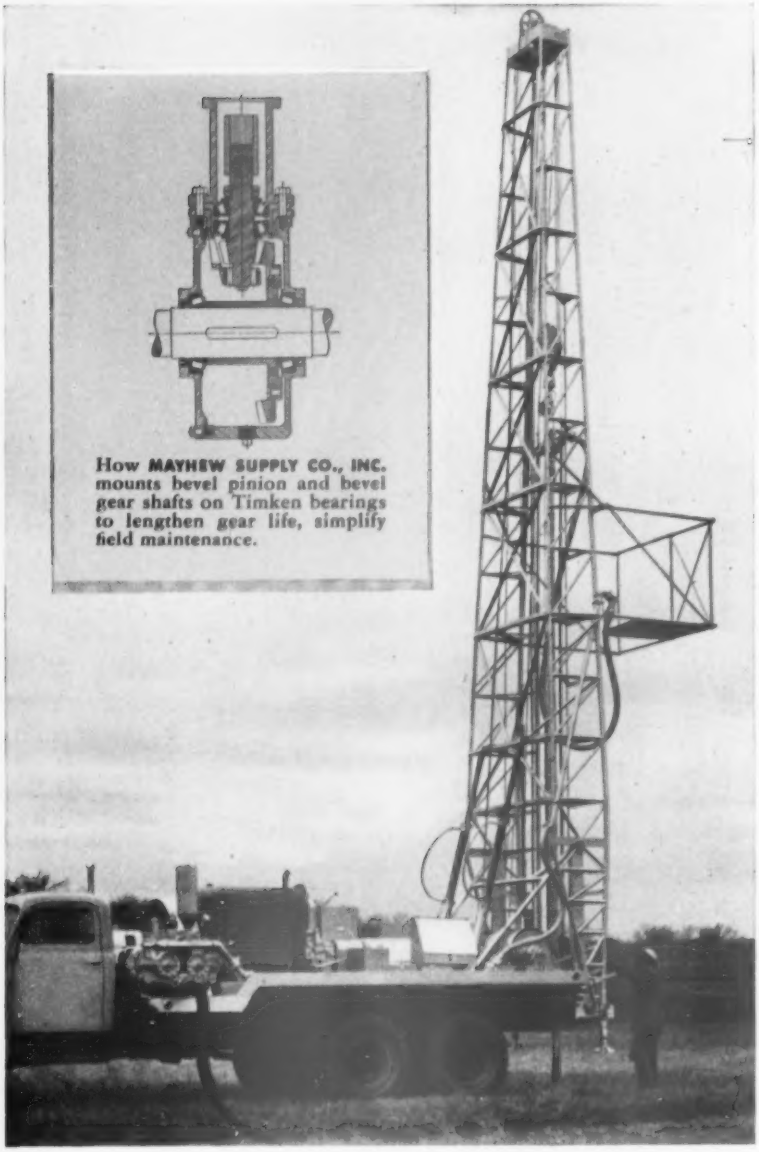
NATIONAL OIL FIELD MACHINERY AND EQUIPMENT • SPANG STEEL PIPE • SUPERIOR & ATLAS ENGINES

NATIONAL BLUE PRODUCTS

IDEAL TYPE "E" HOOK BLOCKS

Designed for heavy duty service with minimum maintenance, National's IDEAL Type "E" Hook Blocks have been designed to support both elevator links and swivel bail simultaneously. Close coupled construction saves vertical derrick space — increases head room. Compact and streamlined, the IDEAL Type "E" Hook Blocks are available in either 90 ton rating (three 24" or 30" diameter sheaves), 140 ton rating (four 30" or 36" diameter sheaves), or 200 ton rating with five 42" diameter sheaves.

Muscled to drill 2,000-foot wells —kept fit with TIMKEN® bearings



How **MAYHEW SUPPLY CO., INC.** mounts bevel pinion and bevel gear shafts on Timken bearings to lengthen gear life, simplify field maintenance.

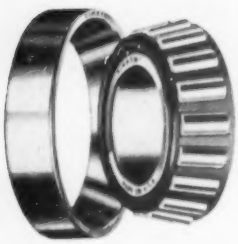
WHEN an exploratory drilling job takes this Mayhew Model 2000 Portable Drilling Rig a hundred miles from nowhere—there's no time for mechanical troubles.

That's what Mayhew engineers had in mind when they used 8 Timken® bearings on bevel pinion and bevel gear shafts, where there are severe radial and thrust loads. Because of Timken bearings' tapered design, they can handle radial and thrust loads in any combination without the aid of extra thrust bearings. Because they hold the shafts rigid, the gears mesh more accurately—and last longer.

Mayhew engineers use Timken bearings on the rotary table sleeve, too. Their extreme precision keeps the sleeve concentric, making closures more effective. As a result, dirt is kept out, lubricant stays in.

It's things like these that normally keep Timken bearings on the job as long as the machine they're part of. If you build drilling equipment, specify Timken bearings; if you use it, look for the trade-mark "Timken" on each bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

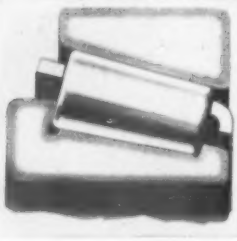
This symbol on a product means its bearings are the best.



TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



HARD ON THE OUTSIDE, TOUGH ON THE INSIDE

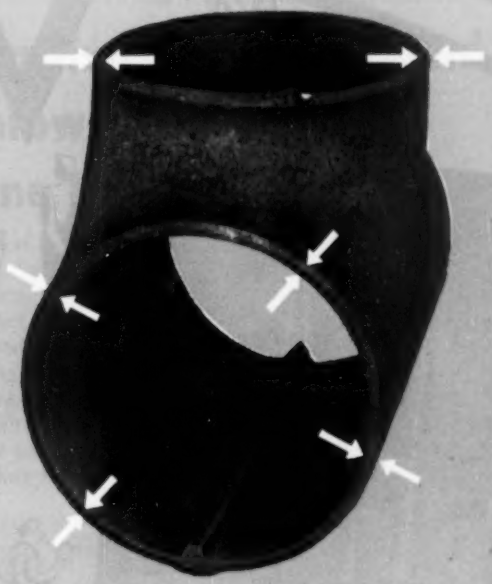
Rollers and races of Timken bearings are case-carburized to give a hard, wear-resisting surface and a tough, shock-resisting core. Result: longer bearing life.

The Timken Company leads in: 1. advanced design; 2. precision manufacture; 3. rigid quality control; 4. special analysis Timken steels.

NOT JUST A BALL ◯ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ↕ AND THRUST →◎← LOADS OR ANY COMBINATION →◎←

EVIDENCE OF SUPERIORITY IN *Corrosive Service*

BEFORE *Midwest 4" extra heavy weight, carbon steel tee showing original wall thickness of tee at right before it was accidentally subjected to corrosive conditions.*



AFTER *When straight pipe in line had failed from corrosion, this Midwest tee was removed. Note amount and uniformity of wall thickness remaining.*

A valve leaked or somebody opened it by mistake . . . so the Midwest Tee shown above was subjected to dilute hydrofluoric acid in addition to its normal service in a 300° F. hydrocarbon line on an alkylation unit.

The highly corrosive acid caused failure of the straight pipe . . . so the entire line had to be replaced. When cut out of the line, the Midwest Tee was found to have a considerable (and uniform) wall thickness. There was no selective corrosion and the weld held up even better than the parent metal.

This was not special alloy made to resist corrosion, but regular Grade "A" carbon steel . . . the same as the new tee shown left above. We do not, of course, recommend carbon steel for corrosive conditions, but, in emergency, it gives good account of itself.

The exclusive Midwest manufacturing process produces fittings of superior metallurgical properties. The metal is worked in compression . . . it is not stretched or extruded, and distribution is uniform. After forming and welding, the fitting is stress-relieved. For further information, write us for a copy of Catalog 48.

MIDWEST PIPING COMPANY, INC.

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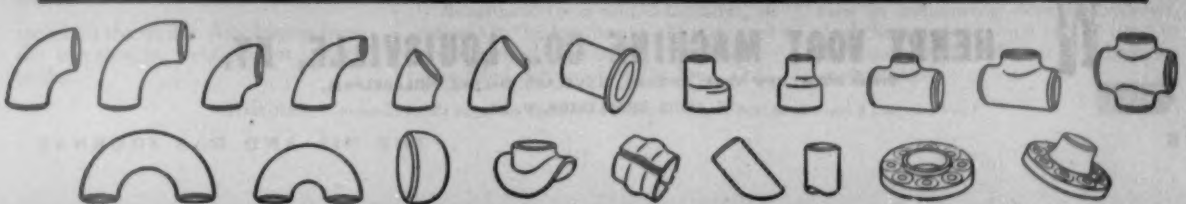
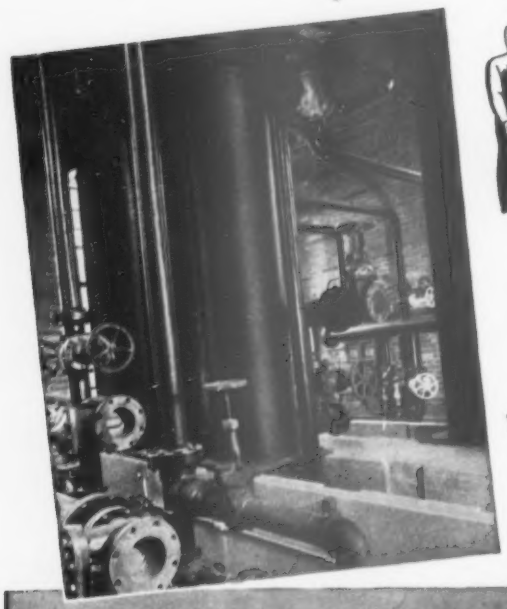
MIDWEST WELDING FITTINGS

IMPROVE DESIGN AND REDUCE COSTS



Dirty Water can't "Shut-down"...

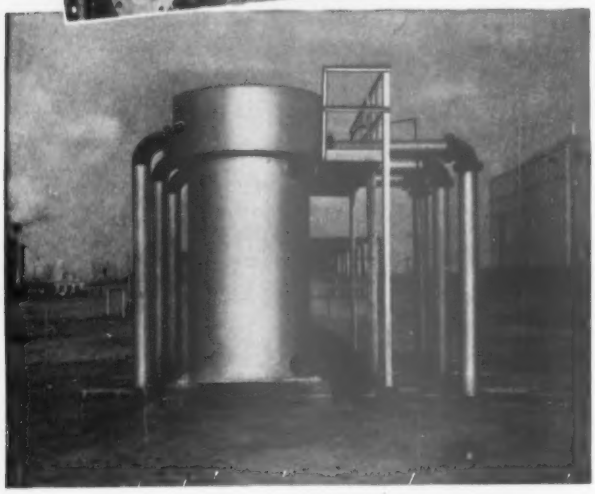
Vogt



film type exchangers

(Condensers—Coolers—Evaporators)

Patent Nos. 1,935,270 - 2,057,597 - 2,424,441



River water, well water or brackish water are all alike to this exchanger *because it can be cleaned* while in operation! The water distributing ferrules need only be removed successively for the cleaning brush or tool whereby the tubes receive additional water which sluices away the dislodged dirt.

Vogt Film Type Exchangers are operating with real economy of first cost, operation and maintenance in power, petroleum, and chemical industries. They serve as Jacket Water Coolers, Feed Water Heaters, Hydrocarbon Evaporators, Sulphuric Acid Coolers, and Sulphur Dioxide Condensers, and can be designed to cool or heat any liquid and to condense or evaporate any fluid.

TOP: *Four units at Newton Falls, Ohio Municipal plant cool water for diesel engines and a lubricating oil cooler.*

BOTTOM: *Jacket Water Coolers serving engines of 7,300 HP in the compression plant of a Western Oil Refinery.*

[Bulletin HE-7 describes typical installations of Vogt Film Type exchangers and is available upon request.]

HENRY VOGT MACHINE CO., LOUISVILLE, KY.

Branch Offices: NEW YORK, CHICAGO, CLEVELAND, DALLAS, PHILADELPHIA, ST. LOUIS, CHARLESTON, W. VA.

PETROLEUM CHEMICALS DIVISION
NEWS

June ★ One of a Series of Interest to the Petroleum Industry ★ 1953

NEW WEST COAST DELIVERY FACILITIES

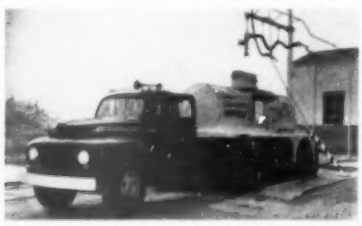
As a service to refiners without rail sidings in the Southern California area and as a convenience for all refiners requiring urgency shipments of tetraethyl lead, Du Pont recently set up facilities for delivering TEL by tank truck.

Located adjacent to Du Pont's El Monte district laboratory, special truck-loading facilities include a rail siding, an 8,500-gallon weigh tank in the all steel TEL building and a 10,000-gallon gasoline tank.

To get the program into operation required more than just specially-built tank truck trailers. A weigh tank like the ones used in refinery blending plants was needed. To load the trucks, the TEL must first be transferred into the weigh tank from railroad tank cars. The procedure is the same as unloading a tank car at a refinery.

Loading the truck for shipment is similar to the procedure involved in transferring TEL from a refinery weigh tank to a standby tank. The tank truck trailer is constructed with the same dome as used on railroad TEL tank cars.

The eductor is used to pull vacuum on the trailer through a one-inch hose attached to the trailer's vent plug. This draws the compound from the weigh tank into the trailer. Any known quantity can thus be weighed out into the trailer.



This close-up of the tank truck facilities shows the 2-inch Du Pont-designed Metalflex hose used in loading the trucks as well as for unloading railroad tank cars.

With a 10,000-gallon gasoline tank to provide circulating fluid for the eductor, the entire setup closely resembles a refinery blending plant. As such, it will be possible to use the plant for training customer blending personnel.

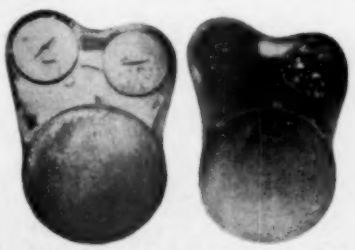
Because of these added facilities, all refiners in the Southern California area are assured prompt, conveniently scheduled deliveries of Du Pont TEL.

Radioactive Tetraethyl Lead Throws New Light on Engine Deposit Formation

Since deposits formed in combustion chambers of automotive and aircraft engines produce undesirable effects, petroleum engineers and engine designers have long sought a method of eliminating them.

It may be possible to accomplish this if the mechanism of their formation and scavenging is understood more completely. However, the lack of a direct method for following the formation while it is occurring has made the study of combustion chamber deposits difficult. The appearance of deposits at any time during their formation *only suggests* the processes which have occurred. But now, the use of tetraethyl *radiolead* in tracer amounts in the fuel provides a new procedure for such study.

DEPOSIT FORMATION WITH TETRAETHYL LEAD IN ABSENCE OF HALOGENS



PHOTOGRAPH AUTORADIOGRAPH*

CONDITIONS:
101 Hours with 3 ML. Tel (Straight)/Gal. +
0.5 Hours with 3 ML. Tetraethyl Radio Lead (Straight)/Gal.

*BLACK = Radioactive Deposits.

The deposit on the cylinder head at left has reached "equilibrium," but has not yet been exposed to operation with tetraethyl radiolead. After being exposed to short operation with radiolead, the autoradiograph of the same cylinder head on the right shows that the most recently formed deposits concentrate on the thicker deposit surfaces.

The technique of studying deposit formation through the use of tetraethyl radiolead was developed at the Du Pont Petroleum Laboratory. It was revealed to the industry in a paper recently presented by Du Pont chemists to the Division of Petroleum Chemistry of the American Chemical Society.

The radioactive lead used in the Petroleum Laboratory's investigations is radium D. This is one of the decomposition products of the uranium series.

USE OF X-RAY FILM

The exact location and distribution of the radioactive lead salts deposited in the chamber can be detected by X-ray film. By this technique, it is now possible to observe the formation and removal of deposits resulting from tetraethyl lead during a relatively short time at any stage of the deposit growth.

It also indicates the importance of temperature and physical state of a surface in influencing deposit laydown. And the new technique can be used to demonstrate the efficiency of halogen scavenging.

OVER

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

PETROLEUM CHEMICALS DIVISION
NEWS

CONTINUED

Radiolead

THERMAL FACTOR

Using radioactive lead as a tracer element, it was found that new deposits form more rapidly on the thicker deposit surfaces than on the thinner deposit or bare metal surfaces. It is believed that this is due to the difference in temperature of these surfaces which produces a sintered surface condition on thick deposits. This condition is conducive to adhesion of fresh deposit.

HALOGEN EFFICIENCY

Halogens ordinarily are used with tetraethyl lead to reduce the amount of deposit in the hotter portions of the combustion chamber. These form lead halides which are too volatile to remain on these hot surfaces.

The Petroleum Laboratory's investigations with radioactive lead showed that established deposits can be scavenged by halogens in the fuel through gas-solid reactions to form volatile lead halides. This scavenging action of halogens also greatly reduces the formation of new deposits on exhaust valves.

DEPOSIT MIGRATION OBSERVED

A previously unrecognized type of scavenging mechanism can now be observed. The migration of deposits within the combustion chamber has long been suspected. But it was not possible to demonstrate this mechanism.

The use of tetraethyl radiolead enables the researcher to see clearly how small particles of the deposit are constantly transferring from one location to another. This process has been called "flecking." It differs from *flaking* caused by rupture of bonds deep-down in the deposit which results in the breaking off of relatively large pieces. This occurs only after relatively long periods of engine operation.

Flecking, on the other hand, occurs continually from the surface of the deposit. And this migration process appears to be responsible for almost all the exhaust valve deposits when halogens are present in the fuel.

This work with radioactive tetraethyl lead is part of Du Pont's continuing study of engine deposits. The aim of this project is to help petroleum and automotive engineers find a practical method of eliminating or controlling combustion chamber deposits.

Du Pont Gadget Show Displays "Ideas"

MECHANICAL INGENUITY is one of our country's most valuable assets.

We are always looking for some gadget to do a job more easily, cheaply, efficiently, or safely. An excellent example of this is the way Du Pont employees representing many of the company's 73 plants and 38 laboratories have applied their inventiveness to solving operations problems.

Since many of the Du Pont employee inventions have broad application in refineries, the company has wrapped them all up into a single traveling exhibit. None of the items displayed are either patented or sold by Du Pont.

Here are just a few examples of the devices included in the show:

1. Scissors-like railroad chock to safeguard workmen's hands.
2. Asbestos heat insulator for gas cylinders.
3. Neoprene-impregnated paper cap. Can be thrown away if splattered with chemicals.
4. Valve lock-out cover to assure safe pipeline maintenance.

Now on tour, the exhibit will be shown in the major refining areas of the country with a Du Pont representative on hand to answer questions.

West Coast District Manager

GEORGE L. TYLER, manager of the Petroleum Chemicals Division West Coast District, came with Du Pont in 1947.

Mr. Tyler's broad experience in the oil industry dates back to the oil fields of Texas in 1921. In 1922 he became associated with the Pacific Gasoline Company which later became part of the Standard Oil Company of California. In 1929 he joined the land department of the Shell Oil Company. He became secretary-treasurer of the California Natural Gasoline Association in 1938.

His first assignment with the Du Pont Petroleum Chemicals Division was as a sales-service representative in the West Coast district. He was appointed manager of this district in 1949.

Mr. Tyler is a graduate of the University of Southern California Law School, and has taken extension courses on petroleum technology.

DU PONT
REG. U.S. PAT. OFF.
Better Things for Better Living
. . . through Chemistry

Petroleum Chemicals

E. I. DU PONT DE NEMOURS & COMPANY (INC.)
Petroleum Chemicals Division • Wilmington 98, Delaware

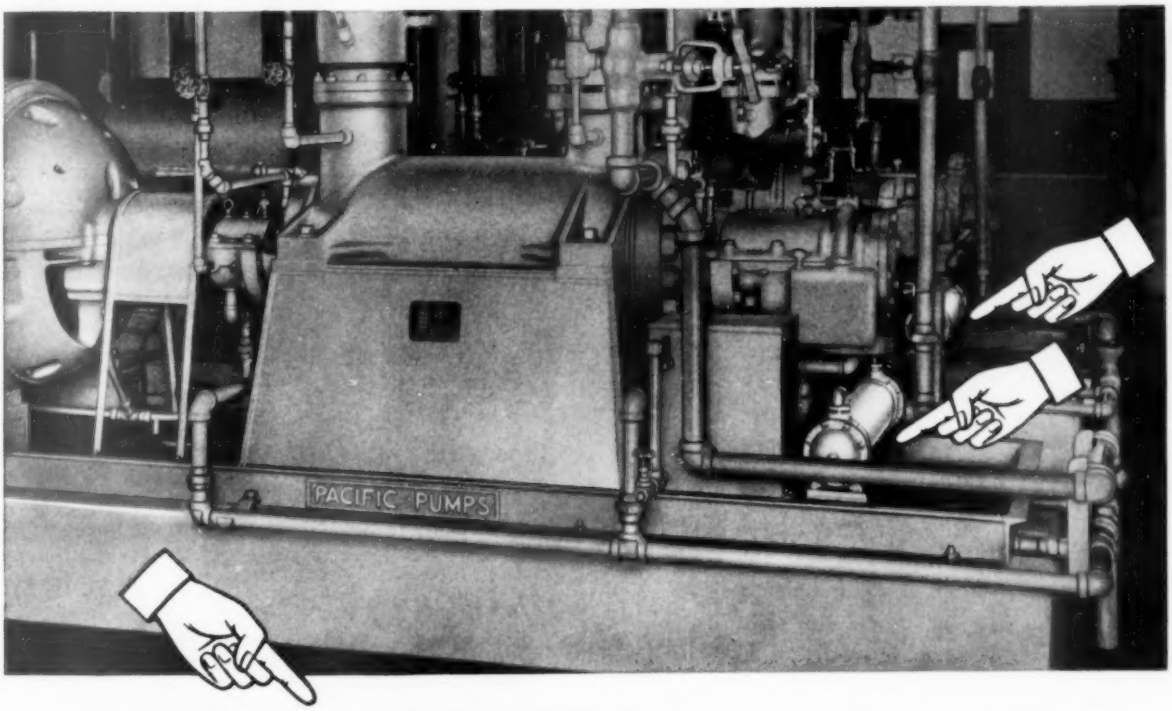
District Offices:
NEW YORK, N. Y.—1270 Ave. of the Americas — Phone COlumbus 5-3620
CHICAGO, ILL.—8 So. Michigan Blvd. — Phone RAndolph 6-8630
TULSA, OKLA.—1811 So. Baltimore Avenue — Phone TUlsa 5-5578
HOUSTON, TEXAS—705 Bank of Commerce Bldg. — Phone PRestan 2857
LOS ANGELES, CALIF.—612 So. Flower St. — Phone MAdison 1691
IN CANADA: Canadian Industries Limited—Toronto, Ont.—Montreal, Que.—Calgary, Alta.

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

A-5521

Printed in U. S. A.

bearings are never "thirsty" for properly cooled lube oil in these Pacific boiler feed pumps



ROSS EXCHANGERS make sure of that!

Delivering 480,000 lbs. of boiler feed water hourly at 295° F against a discharge pressure of 1222 psi, each of these Pacific Type ABF Boiler Feed Pumps has been *"fabricated from materials selected for specific functions."*

To hold lube oil temperatures under close control—Pacific Pumps, Inc., one of the Dresser Industries, factory-installs Ross Type BCF *all copper and copper alloy* Exchangers. Pressure lubricated radial and thrust bearings are never "thirsty" for properly cooled lube oil. They *always* have enough. *Overheating is effectively ... dependably ... prevented!*

Petroleum refineries, industrial and public utility power plants all benefit from the built-in temperature protection of Ross Exchangers—not only in Pacific and *other* leading make pumps, but in *many* types of primary equipment: engines, compressors, turbines, hydraulic equipment, speed increasers, transformers and commercial vehicles.

Why? Pre-engineered, fully standardized Ross Type BCF Exchangers have an unrivaled reputation for ruggedness and reliability. More information is in Bulletin 1.1K5. Write for your copy.

KEWANEE-ROSS CORPORATION
DIVISION OF AMERICAN RADIATOR & STANDARD SANITARY CORPORATION
1417 WEST AVENUE • BUFFALO 13, N. Y.
In Canada: Kewanee-Ross of Canada Limited, Toronto 5, Ont.

Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS

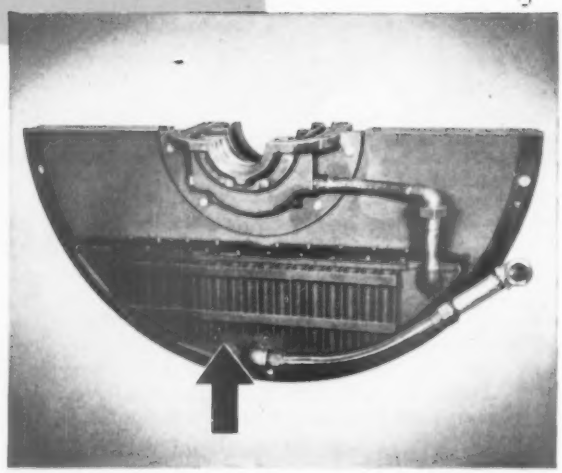
3 like this for TEXAS EASTERN

ELLIOTT

squirrel-cage induction motor designed especially for pipe line service

Above is shown one of the three Elliott 2500 hp 2-pole motors now serving Texas Eastern Transmission Corporation, driving compressors on the pipe line. Special waterless oil-cooling feature is described at the right. These big motors are built of fabricated steel, engineered for extreme rigidity, ease of access and maintenance, and may be supplied in any type of enclosure, standard or special.

Write for the Induction Motor Bulletin.



THE AIR-COOLED OIL RESERVOIR is shown in this inside view of a bearing bracket. Note the heat-radiating fins which lie right in the path of incoming ventilating air. This feature not only eliminates the complexities of water circulation apparatus, but better still, makes water unnecessary — a vital factor where water is at a premium.

ELLIOTT Company

Ridgway Division
RIDGWAY, PA.

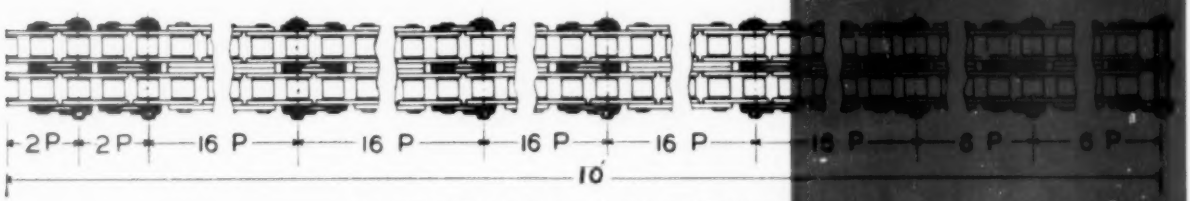
FOR MOTORS 1—200 HP:
CROCKER-WHEELER DIV., AMPERE, N. J.
Plants at: JEANNETTE, PA. • RIDGWAY, PA.
AMPERE, N. J. • SPRINGFIELD, O. • NEWARK, N. J.
DISTRICT OFFICES IN PRINCIPAL CITIES

R 2-22

Now it's Even Easier!

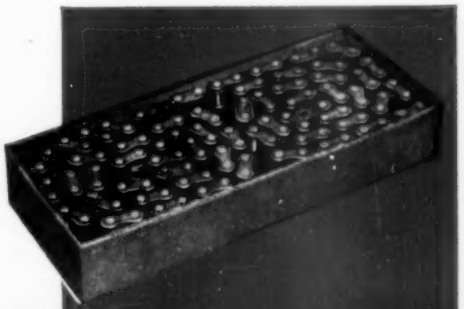
TO MAKE UP THE EXACT LENGTH OF CHAIN YOU NEED WITH IMPROVED BALDWIN ASSEMBLY RIVETED ROLLER CHAIN

The original Baldwin Assembly ("BA") Riveted Roller Chain completely eliminated old-fashioned, time-consuming, temper-trying, expensive chain cutting, while giving the user all the longer lived advantages of riveted chain. Now, with *Improved* Baldwin Assembly, chain coupling, uncoupling and repairs are faster, easier, less expensive than ever before.

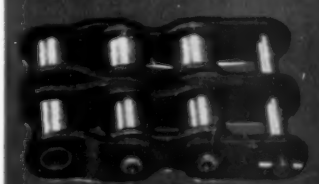


No. 100 Baldwin Assembly Riveted Roller Chain

You buy Baldwin Assembly in a packaged unit—a 10-foot strand in every box. Each strand contains a number of conveniently located coupler links at which points the chain can be quickly and easily taken apart. (The location of the coupler links varies slightly for each chain size.) By combining two or more of the sections in the basic 10-foot length, any length of chain required can be made up in the shortest possible time. What's more, there's no danger of damaging chain parts while doing it. If more than 10 feet of chain is needed, just buy an extra box.



SPECIAL PURPOSE SECTIONS



A 3-Pitch Riveted Offset Section

This unit consists of an offset link and a coupler link riveted to a roller link. Use it for any drive requiring an odd number of pitches. We recommend this section instead of a single offset link because the rivet-ed construction increases structural rigidity and durability.

A 3-Pitch Repair Section

This unit consists of two coupler links riveted to a roller link. When one or two links are accidentally damaged, it is often economical to repair the damage with a 3-pitch repair section rather than replace a longer section.

Get all the facts on why the Improved Baldwin Assembly is better than ever. See your local supply store or write for Bulletin 52-3. Chain Belt Company, 4619 W. Greenfield Ave., Milwaukee 1, Wis.

BALDWIN-REX® ROLLER CHAINS

A PRODUCT OF

Chain Belt COMPANY *OF MILWAUKEE*

Baldwin-Rex Oil Field Sales Offices:

New York • Tulsa • Dallas • Houston • Midland • Los Angeles

Sold in leading supply stores throughout the oil country

meet the MARLEY man

who built the world's largest cooling tower installation.....

Andy Anderson, a Marley construction superintendent, may well point with pride to the world's largest cooling tower installation. Under his expert guidance, 55 carloads of prefabricated redwood lumber and Marley mechanical equipment were efficiently assembled into the giant Twin-Flow cooling tower installation you see.

Andy Anderson is typical of Marley's 22 construction superintendents whose average length of service with the company is 15 years. They all know cooling towers from the ground up, know how to get the job done efficiently and economically whether you or Marley furnish the labor. Each man has a wealth of cooling tower erection training and experience that fits him well for his important function in the Marley organization. Every member of this group is selected for his ability to cooperate fully with your engineering staff.

Whether you need 100- or 100,000-gallon cooling towers, Marley men like Andy Anderson supervise the installation. For complete details on the many advantages of putting your confidence in Marley products and Marley people, see your nearby Marley sales engineering office.

MARLEY

The Marley Company

Kansas City, Missouri

They Say—

Order or Injunction "Must Go"

". . . On March 25, the Texas Railroad Commission issued a conservation order effective April 1, shutting in all Spraberry wells in this field until such time that all the gas gathering, processing, and marketing facilities and trunk lines could be installed to accommodate gas from all Spraberry wells.

"This extraordinary move to avoid gas waste was immediately attacked through court injunctions which restrained the commission from enforcing the order with respect to the few wells presently connected to plants and marketing outlets . . .

"The combination of the order and the injunctions means that the majority of shut-in properties are being drained of oil and gas to some extent by the few wells favored in the temporary court order.

"Your company is actively intervening to protect its interest but supporting the actual conservation efforts of the commission. We are, in effect, raising the question of whether the commission's order is invalid and should be withdrawn or that the injunction must be lifted to correct the otherwise unfair situation which currently lets a few fortunate plant and field operators take advantage of the legal tangle and thus drain neighboring shut-in properties."

R. W. French, general manager of production department of Standard Oil Co. (Ohio), at company's eighty-third annual stockholders meeting.

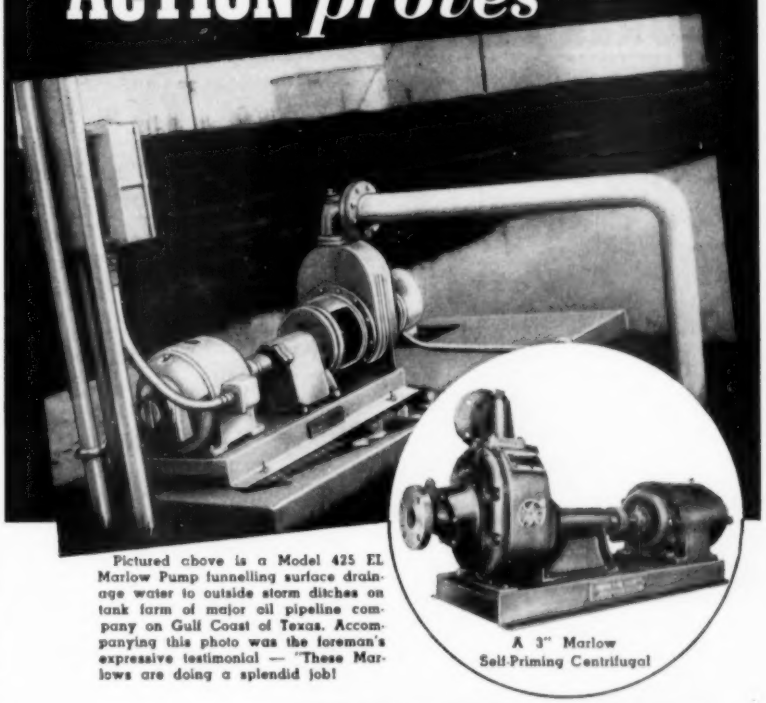
Greatest Impediment to Trade

"American exports and the projection of American capital into foreign countries for production facilities at present are in a state of dramatic and painful collapse because of the shortage of dollar exchange. And, in turn, this dollar shortage has become increasingly critical because exchange transactions throughout the world, the conversion of one paper money into another, or the conversion of paper money into gold are still governed by pegged rates, embargoes, allocations, and other restrictions of the managed-currency thesis.

"It is about time for us to be done with these fallacious rules. . . It is time for us to return to free, open money markets, unrestricted conversion for paper monies and gold.

"There is so little time. The drastic drop in our exports, induced by further lack of dollar exchange, could seriously

ACTION *proves*



Pictured above is a Model 425 EL Marlow Pump funnelling surface drainage water to outside storm ditches on tank farm of major oil pipeline company on Gulf Coast of Texas. Accompanying this photo was the foreman's expressive testimonial — "These Marlows are doing a splendid job!

A 3" Marlow Self-Priming Centrifugal

MARLOW PUMPS

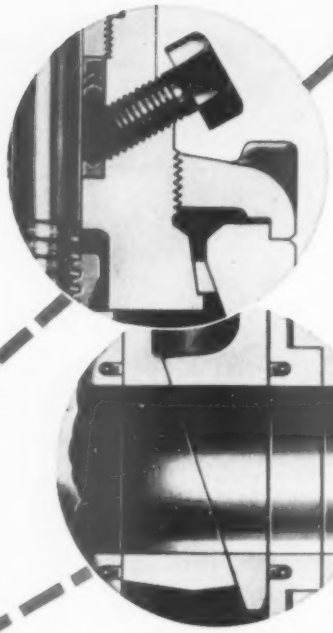
are specified and PREFERRED for DEPENDABLE performance

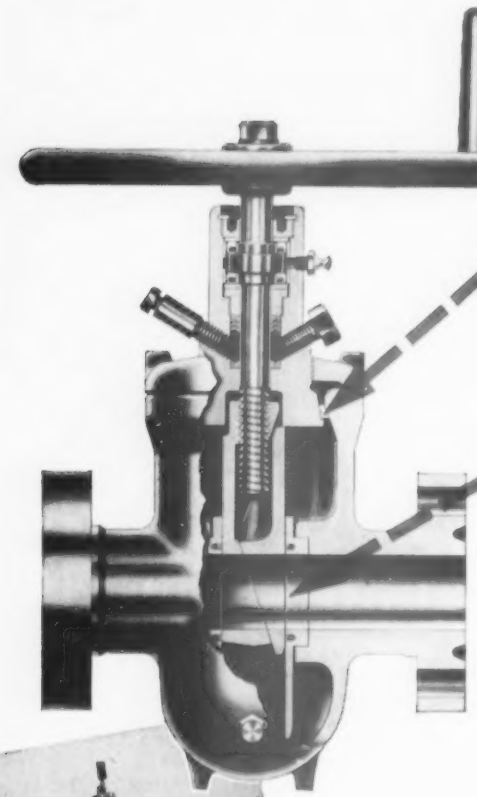
Disposing of surface drainage water in the field and around refineries are only one of many jobs given to Marlow Pumps to do. With the world's largest assortment of sizes and capacities available, veteran oilmen have become accustomed to specifying Marlow Self-Priming Centrifugal Pumps wherever dependable, maintenance-free operation is important. They prime automatically on suction lifts and will not vapor-lock. Marlow installations for handling water or petroleum products are increasingly frequent — and well justified — by their fine operating record and built-in quality construction.

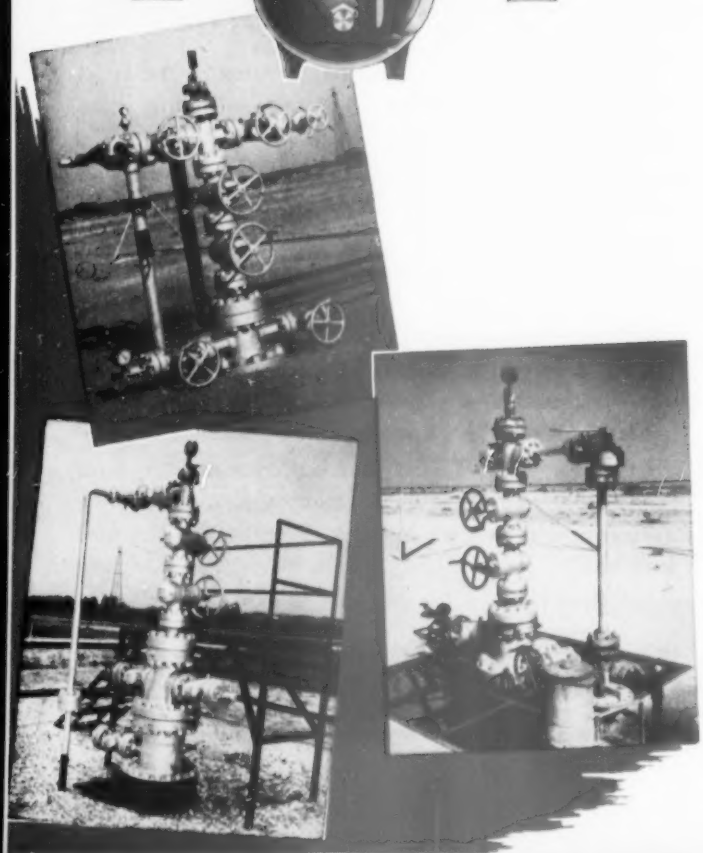
For complete details and engineering solutions to your pumping problems, see your nearest Marlow dealer or write direct for the "Marlow Oil Country Bulletin."

MARLOW PUMPS RIDGEWOOD, NEW JERSEY
Branch Plants: DeQueen, Arkansas
West Chicago, Illinois
266 Other factories in France and England. Distributors and Dealers everywhere.

METAL-TO-METAL SEAL IN W-K-M VALVES INSURES COMPLETE SAFETY UNDER ALL CONDITIONS







Under high temperatures or during a fire, W-K-M Valves hold tight whether they are in open or closed position. Metal-to-metal seals at the critical points insure complete safety under all conditions. There are no "O"-rings, synthetic gaskets or inserts of any kind to burn out and cause leakage.

Even if the plastic packing should burn completely out, you still have a leak-proof closure or leak-proof conduit because the line pressure cannot enter the valve body when the valve is in open or closed position.

Full through-conduit flow without turbulence, pressure seal bonnet and superfinished roller bearing stems for easy operation are a few of the other operational advantages of W-K-M Valves which have made them standard equipment for Christmas trees the world over.

W-K-M COMPANY

P. O. BOX 2117 HOUSTON 1, TEXAS

2330 E. 8th St., Los Angeles, Calif.

EXPORT OFFICE: 30 Rockefeller Plaza, New York, N. Y.

W-K-M *Valves*

Eighty Percent of the World's High Pressure Wells are Controlled with W-K-M Valves

impair our domestic economy and create widespread unemployment. The resumption of the program for lower tariffs would be a very important move in the right direction, but . . . our protective tariff system is not at present the greatest impediment to the continuation of our foreign trade. The greatest impediment to it now is the prevalence of pegged exchange rates or lack of convertibility of one country's paper money into another, or of any paper money into gold, at open market rates, as governed by the law of supply and demand."

James D. Mooney, president, F. L. Jacobs Co., addressing the Empire State Petroleum Association, New York.

Executive Problem Growing

"It is becoming increasingly difficult for large corporations to obtain or retain men for top jobs.

"They are burdened with unusually heavy responsibilities, long hours, and the need for constantly moving about. The tax bite, as you must realize from your own experience, has taken away most of the former lure of big salaries. The honor and glory of high sounding titles are short lived.

"About the most effective inducement seems to be the provision made for some degree of security for a man and his family during periods of illness and after retirement. However, no adequate incentive has yet been devised for overcoming the growing preference of energetic people with marked ability to live a more peaceful life in smaller communities where they can be their own boss and spend more time with their families.

"Perhaps in the long run this is for the best, tough as it will be for the big companies which are always going to be necessary for the bigger undertakings required to maintain this country's industrial leadership."

George V. Holton, chairman of the board, Socony-Vacuum Oil Co., Inc., at the annual meeting of stockholders.

Expectations Abroad

"We feel that a foreign government which lets oil concessions to private individuals or companies may rightfully expect:

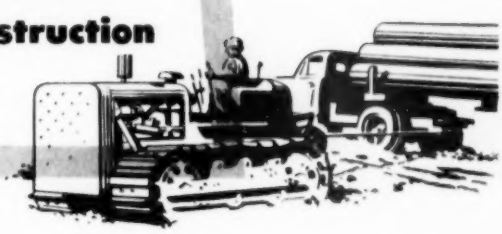
"1. That an adequate participation in the proceeds from the enterprise should accrue to the government.

"2. That operations shall be so conducted as to contribute to the domestic economy of the nation.

"3. That domestic demands for oil be fully satisfied before any oil is exported.

"4. That development and production proceed in an orderly manner with

12 CARCO WINCHES speed up jobs for Houston Construction Company

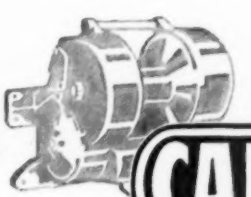


IN PREPARING THE BED on a 40-mile stretch of a 158-mile, 30-inch pipeline from Texas to Tennessee, the Houston Construction Company used one of their 12 Carco GO winches to tow a 30-ton ditcher. This ditcher has a 12-foot cutting wheel that cuts about one mile of bed, 5½ ft. wide by 6 ft. deep, every 12 hours.

Carco GO winches were specified because this winch was designed and built for pipeline and oil field work. It's a two-speed winch . . . a slow speed with high line pull for the hard, steady pulls needed in towing heavy machinery, rescuing mired and ditched equipment and pulling long pipe sections . . . and another speed for lighter winching jobs such as loading, unloading, lifting pipe, and general construction and oil field uses.

The Carco GO winch has an extra large cable capacity for the "long reach." It mounts on tractors in the 76- to 100-horsepower range. A four-roller fairlead, which maintains maximum line pull regardless of the direction of the load, can be easily attached. See your nearest Carco dealer. PACIFIC CAR AND FOUNDRY COMPANY, Renton, Washington. Branches at Portland, Oregon and Franklin Park, Illinois.

WINCHES FOR ALL INDUSTRIAL TRACTORS



CARCO

In Open-Hole Shooting . . .

RESULTS COST LESS WITH WELEX TORPEDO-JETS!

When Welex developed the 5⅝-inch TORPEDO-JET in 1948 it was the first real improvement in 50 years in the technique of open hole shooting. Since its introduction to the oil industry this tool has been cutting costs and increasing productivity for thousands of well operators.

Welex engineering research is continuously improving the effectiveness of TORPEDO-JET shooting and other Welex services. Better methods and equipment are important extras you get when you call on Welex for jet perforating services.

Ask your Welex service engineer about applications of the powerful, versatile TORPEDO-JET process in open hole shooting and other problems.

ACCURATE SHOOTING IN SPECIFIED ZONES

EXTREME PENETRATION

LARGE HOLE DIAMETER

REDUCED CLEAN-OUT TIME AND COST

SAFETY FOR WELL AND PERSONNEL

FAST SERVICE BY EXPERIENCED WELEX CREWS

ORIGINATORS OF Welex JET PERFORATING

Welex
JET SERVICES INC.
General Offices: 3909 Hemphill St., Fort Worth 10, Texas

"Call Welex and Be Sure"

no avoidable waste of the natural resource.

"5. That the enterprise give to local citizens training and employment at fair rates of compensation.

"6. That oil and oil products available for export move to market in fair volume at fair prices.

"On the other side, we believe that the foreign government should assure continuously for the period of the concession to the company:

"1. Security of title to the property or rights conceded.

"2. Managerial control of the company's operations.

"3. The opportunity to make a reasonable profit from the enterprise.

"These conditions we have found to benefit all parties concerned."

Henry H. Hewetson, director of Standard Oil Co. (N.J.), before the second Student Conference on Inter-American Culture and Education, Rutgers University.

Immediate Profit Can Mean Loss

"We in the petroleum industry pride ourselves in our belief that competitive enterprise can solve its own problems. Calling on government to solve our problems for us is perhaps one way of getting them solved—but it is a very perilous way.

"It can set off a chain reaction which would ultimately destroy this free industry and other industries with us.

"The true business statesman has learned that he must look beyond immediate profit. He must have the vision and the wisdom to discern the policy that will best serve the future, because he expects his company and his industry to be operating then and living within the atmosphere he creates today."

Frank M. Porter, president, American Petroleum Institute, addressing the Independent Oil Men's Association of New England, Boston.

Success Analyzed

"Success is the product of two factors—circumstances and personal characteristics.

"Some may succeed out of sheer weight of circumstances that may fortunately be favorable. But all have the opportunity to compensate ordinary or below-average circumstance by developing three personal qualities: Effort, the step to success; knowledge, the avenue to opportunity; and command of language, the measure of worth in an organization.

"One way to assist the apprentice is to pass to him some well-founded advice in respect to those elements that may contribute to success in the prac-

Pyrene* has extinguished more major oil fires throughout the world than any other air foam equipment. This is an earned reputation that you can rely on in considering your own protection. Pyrene can provide you with a built-in air foam system or portable equipment that precisely meets your requirements no matter where or what your fire hazard is. For complete information, or the help of a Pyrene engineer, write us today.

*T.M. Reg. U.S. Pat. Off.

PYRENE MANUFACTURING COMPANY

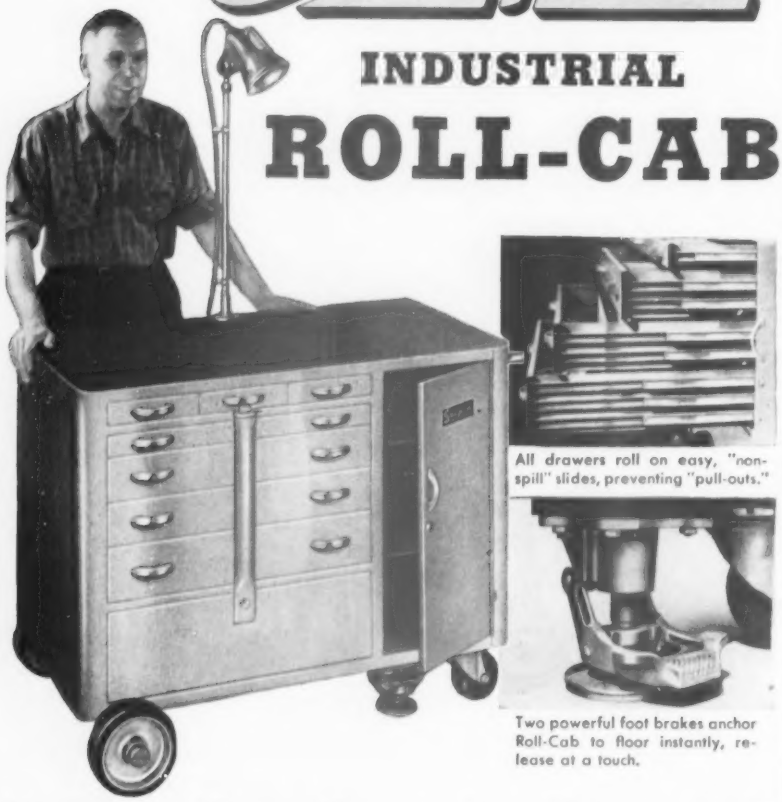
579 Belmont Avenue — Newark 8, New Jersey

Affiliated with C-O-Two Fire Equipment Co.

The Pyrene Company Limited, England Pyrene Manufacturing Co. of Canada Limited

Snap-on*

INDUSTRIAL ROLL-CAB

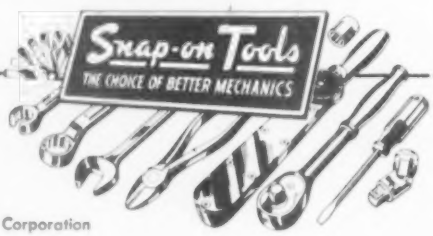


All drawers roll on easy, "non-spill" slides, preventing "pull-outs."

Two powerful foot brakes anchor Roll-Cab to floor instantly, release at a touch.

"rolls the shop to the job"

You'll speed up *any* maintenance job when you give a man the needed tools, plus a sturdy bench, right at arm's reach, anywhere in the plant. That's what a Snap-on Roll-Cab does. It ends those repeated trips back to the tool crib. Its reinforced steel construction (weight, 388 pounds, empty!) provides a sturdy, steady base for vises, grinders, etc. Work top is smooth, enduring masonite. Handy outlets for power tools. Full-adjustable lamp. Big, rubber-shod wheels, two swiveling. Positive foot brakes anchor the bench securely. Durable, baked-on red enamel finish. Write for new Industrial Catalog and General Catalog of 4,000 hand and bench tools. Direct Snap-on service to industry everywhere through factory branch warehouses in 42 industrial centers.



SNAP-ON TOOLS CORPORATION
8098-F 28th Ave.
Kenosha, Wisconsin

*Snap-on is the trademark of Snap-on Tools Corporation

tice of technology as a profession."

Herman H. Kaveler, consultant, speaking before the Mid-Continent Section, American Institute of Mining and Metallurgical Engineers.

How Executives Get That Way

"... Few people start out in life with the idea of becoming an executive. Most of us, I think, begin our careers in some specialized field, perhaps science or finance or law, and as young men, our hopes and aspirations are bound up in the pursuit of that chosen vocation.

"Executive responsibility comes later in life, almost wholly as a result of the office seeking the man, and often as a complete surprise. That is as it should be, for while there are always volunteers for better jobs, the raised hand is rarely a satisfactory guide."

Crawford H. Greenewalt, president, E. I. du Pont de Nemours & Co., before the Executives' Club of Chicago.

Proof of Competition

"The healthy size of the advertising budgets of American oil companies clearly reflects the intense competition that exists in the oil industry, with each fellow trying to make better products at lower costs for consumers."

Storrs J. Case, advertising manager, Sun Oil Co., speaking before an advertising-sales conference of the New Jersey Press Association.

The Times Views With Regret

"We believe that in years to come it will be a source of deep and bitter regret that the federal Government was deprived of control over the private development of these offshore oil resources. It is practically certain that the President will sign the bill, once differences between House and Senate versions are eliminated, because he was unfortunately persuaded long ago to accept the broad principle involved."

Editorial in the New York Times.

CALENDAR

JUNE

7-12 Society of Automotive Engineers, summer meeting, The Ambassador and Ritz-Carlton Hotels, Atlantic City, N. J.

14-18 Canadian Gas Association, Windsor Hotel, Montreal, Canada.

15-19 American Association for the Advancement of Science, petroleum conference, Colby Junior College, New London, N. H.

15-19 American Institute of Electrical Engineers, summer general meeting, Chalfonte-Haddon Hall, Atlantic City.

15-19 American Petroleum Institute, Division of Production, midyear committee conference, Hotel William Penn, Pittsburgh.

16-19 American Welding Society, national

$$$ $$$ $$$

save in thribbles by 3 stage cementing!

HALLIBURTON'S DV MULTIPLE STAGE CEMENTER

Downhole performance of this DV Cementer is providing operators with striking evidence of outstanding ability to cement not just one, or even two, but *three stages* without removal from the hole.

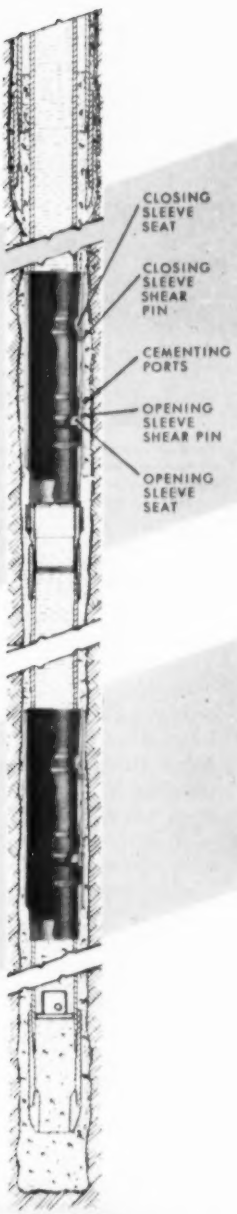
And that saves casing, cement, time – and money.

The three stage cementer is an all-around performer. It is applicable in handling a wide variety of jobs successfully – full depth cementing, dual well completion, cementing off formations at any given point, reducing channeling, limiting pump pressures, and preventing slurry loss.

Halliburton's exclusive Differential Valve, employing the differential principle of hydraulics, makes the big difference between this and ordinary cementing tools.

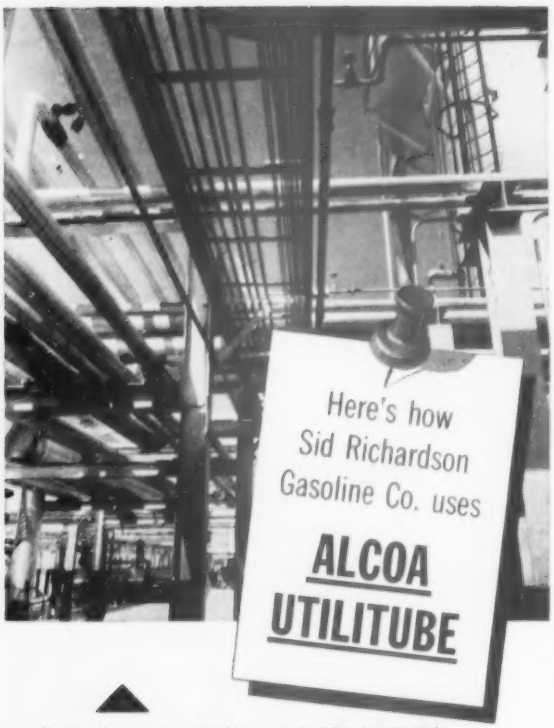
It features two telescoping steel sleeves. The lower or opening sleeve seals off tool ports during circulation and passage of cement for the lowest job. An upper or closing sleeve seals tool ports after completion of the next stage. A special arrangement of opening and closing plugs and tool sleeves provides effective, yet simple three stage cementing.

The DV is built by men who know cementing best, and is backed by the hard-won experience of more than a million cementing jobs. Take advantage of it on your next job. Phone your nearby Halliburton representative. Or contact Halliburton Oil Well Cementing Company, Duncan, Okla.



HALLIBURTON

YEARS AHEAD IN ADVANCED CEMENTING TECHNIQUES!



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spring technical meeting, Shamrock Hotel, Houston.

JUNE 16-JULY 2 Intensive Course and Research Conference on Phase Behavior of the Hydrocarbons, University of Michigan, College of Engineering, Ann Arbor.

18-19 Pennsylvania Grade Crude Oil Association, annual meeting, Hotel William Penn, Pittsburgh.

18-19 Western Petroleum Refiners Association, regional technical-industrial relations meeting, Conrad Hilton Hotel, Chicago.

18-20 National Society of Professional Engineers, annual meeting, Sheraton-Beach Hotel, Daytona Beach, Fla.

24-27 Intermountain Association of Petroleum Geologists, fourth annual field conference, Ben Lomond Hotel, Ogden, Utah.

June 28-July 2 Petroleum Equipment Suppliers Association, annual meeting, Broadmoor Hotel, Colorado Springs, Colo.

JUNE 29-JULY 3 American Society for Testing Materials, annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

JULY

July 30-Aug. 1 Wyoming Geological Association, eighth annual field conference, University of Wyoming, Laramie.

AUG.

17-19 Society of Automotive Engineers, international West Coast meeting, Georgia Hotel, Vancouver, B. C., Canada.

18-21 American Institute of Electrical Engineers, Vancouver Hotel, Vancouver, B. C.

24-26 Appalachian Gas Measurement Short Course, West Virginia University, Morgantown, Va.

SEPT.

6-11 American Chemical Society, national meeting, Conrad Hilton Hotel, Chicago.

9-11 Pacific Coast Gas Association, San Francisco.

11-12 Association of Desk and Derrick Clubs of North America, annual meeting, Cosmopolitan Hotel, Denver.

13-16 American Institute of Chemical Engineers, Fairmont and Mark Hopkins Hotels, San Francisco.

15-16 American Petroleum Institute, executive committee, Greenbrier Hotel, White Sulphur Springs, W. Va.

16-18 National Petroleum Association, annual meeting, Hotel Traymore, Atlantic City, N. J.

21-25 Instrument Society of America, national instrument conference and exhibit, Sherman and Morrison hotels, Chicago.

24-25 Western Petroleum Refiners Association, regional meeting, Henning Hotel, Casper.

27-30 American Society of Mechanical Engineers, annual conference, petroleum division, Rice Hotel, Houston.

28-29 Independent Natural Gas Association of America, Shamrock Hotel, Houston.

Sept. 30-Oct. 2 American Association of Petroleum Geologists, Mid-Continent regional meeting, Masonic Building, Wichita.

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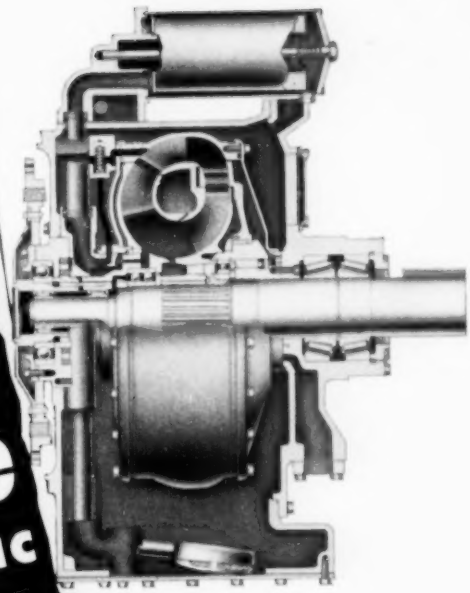
Two-Stage HYDRAULIC TORQUE CONVERTER



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Typical Twin Disc Two-Stage Hydraulic Torque Converter, Model SD (shown above), with Spider Drive and Disconnecting feature.

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THE OIL AND GAS
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TULSA, OKLAHOMA

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JOURNALLY Speaking

Centennial of a First

THE oil industry will formally celebrate its 100th anniversary in the fall of 1959, but actually this month is the centennial of an event which led to the founding of the industry. It will be celebrated June 29 at the spot where it occurred—on the campus of Dartmouth College at Hanover, N. H., about as far removed from oil-industry activities as one can find in this country.

Back in the early 1850's a couple of shrewd Yankee free-enterprisers looking for ways to turn an honest dollar got interested in the "Seneca oil" which the Indians had long been skimming off certain springs in western Pennsylvania and using for medicinal purposes. They obtained a sample from the big oil spring on the property of Titusville Lumber Co. and asked a couple of their former chemistry professors at Dartmouth to see if it had any commercial possibilities.

In June 1853 these professors conducted the first scientific analysis of crude petroleum. They concluded that it could be broken down by distillation into products which would be highly valuable for lubrication, illumination, and other purposes, but they warned that it would have to be produced in volume in order to make refining and marketing a paying proposition.

This was all the encouragement the young Dartmouth grads needed. They formed the Pennsylvania Rock Oil Co. and leased the spring from the lumber company with an agreement to pay a royalty of one-eighth of the oil produced. But investors of that day didn't put much faith in the business judgment of college professors, and the company was reorganized a couple of times before it had enough capital to hire a retired railroad conductor named E. L. Drake to dig into the spring to find the source of the oil.

Drake had so much trouble digging that he finally hired a salt-well driller to improvise a string of tools and drill for the stuff—contrary to his instructions from the New York office. On August 26, 1859, the Drake well struck oil at 69½ ft. and pumped 400 gal. per day, and the oil industry was born.

We like to tell this story because it illustrates three things that have meant petroleum progress for a hundred years: scientific research, individual initiative, and improvising on the spot. And so this month leaders of the oil industry will dedicate a plaque on the elm-shaded, ivy-clad wall of the building which saw the world's first scientific analysis of petroleum.

New Crusade

ANOTHER anniversary was celebrated on the other side of the world last month—the 500th anniversary of the fall of Constantinople to the Turks. The city that had been the eastern outpost of western culture for 1,000 years then became the western outpost of eastern culture, and remained such until right after World War I.

But during the last generation Constantinople, now Istanbul, has become more and more westernized, along with the rest of Turkey. The most recent, and perhaps the most significant, step was the denationalization of Turkey's infant oil industry.

Oil was discovered in Turkey 3 or 4 years ago, and a state monopoly was created to develop it. There were visions of pipe lines and refineries, self-sufficiency and export profits. But very little more oil was found, and the rosy promises failed to materialize.

So, a few months ago, the Turkish leaders adopted the western idea that the way to get something done is to make it attractive to ambitious individuals to tackle it, and they opened up Turkey's oil industry to private concessions to American and other oil men. Thus oil men have a chance to do what all the crusades of the Middle Ages failed to do—recapture Turkey for the West, and without bloodshed or conflict but with profit to all.

Henry D. Ralph

a well-side chat

about "permanent" installations of

BAKER RETAINER PRODUCTION PACKERS

(SETTING) *Melvin Matthews, Baker Branch Manager, chats with an operator in the Magnolia Field in Southern Arkansas, who has a number of wells ready to go on the pump.*

(TIME) *December, 1952.*

Operator: What experience have you had with Baker Packers in *this* field?

Matthews: Well, we just finished setting a Baker Packer in *this* well.

Operator: What do you mean? This well has been on production for ten years.

Matthews: You're right. A Baker Model "B" Packer was run in on tubing and set in December, 1942. At that time the well had a bottom-hole pressure of 3,750 psi.

Operator: You mean the packer has been in all that time and held up for ten years?

Matthews: That's right, for 10 years. You know Baker claims that their packers are for "permanent" installations, and I guess when a packer stands up for ten years with that differential across it that's "permanent" enough, and mighty good performance.

Operator: Sure sounds "permanent" enough for me. By the way, how many Baker Packers are in this field anyway?

Matthews: Well, I don't know exactly how many were set to start with, but there are 31 I can think of right off hand that were set in 1942 and are still operating perfectly.

Operator: Man, that's a lot of packers in one field like this. Will the new packer you just set in this well be good for another ten years?

Matthews: It will probably be good for 20 years, because it was the new "D-4" packer, and they should easily last twice as long.

Operator: What makes you think that?

Matthews: Well, there are a number of reasons. In the first place the packers set here in 1942 had the seal in the packer and it couldn't be repaired. With the new "D-4" the seals are on the Tubing Seal Nipple which is part of the tubing string, and when the seals need repairing you just pull the tubing, install new seals on the Baker Tubing Seal Nipple and run in again.

Operator: That sounds like a real improvement.

Matthews: Yes, it was, but that's just part of it. With wells getting deeper and both pressures and temperatures higher, the new Baker Packers have lead seals to back up the resilient packing element, and then we put in malleable iron rings to back up the lead seals. Our Engineering Department found that when things got really tough the resilient packing element wouldn't stand up by itself, and even the lead would give way sometimes under extreme conditions. So, we backed up the lead with malleable iron rings—and believe me, that did it.

Operator: Sounds like you *could* be right about that new packer lasting 20 years. But what about drilling out the packer if you have to go on the pump?

Matthews: No trouble at all. The new packer is just as drillable as the old type was, and operators around here know that *it* drills up easily because they've had to drill 'em when the wells finally quit and had to be put on the pump.

Operator: Well, I guess you're right about "permanent" installations. If a packer holds out until the well quits and you have to put her on the pump, that should be "permanent" enough to satisfy anybody.

•

The Baker Retainer Production Packer has so many other advantages besides being "permanent" that you ought to know all about it. You should know how it can be set on a wire line (as well as on tubing or drill pipe)—how it virtually becomes part of the casing, leaving the tubing free to be run or pulled as often as necessary—how you can produce two zones separately and simultaneously.

There's a new issue of Baker Equipment News on the subject of "Dual Zone Completion Practices" which is well worth your study. Ask any Baker representative or office for your copy.

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BAKER RETAINER PRODUCTION PACKER....

Product No. 415-D

Available through any Baker office or representative

Now comes the sad truth about "oil-rich tidelands"

THE American public is due for a disillusionment on "tidelands oil" because of the fantastic ideas of easy and fabulous wealth which were tossed around during Congressional debates. The new law defining state jurisdiction was pictured as giving great riches and resources to the states and to the oil industry.

But there will be no rush of drillers to the marginal sea, no big outpouring of oil, no quick riches to producers or coastal states. And therein lies a danger, for those who have been expecting such may accuse the industry of stalling or conspiring to restrict production.

CONGRESS has now returned administration of part of the offshore strip to the states, but the procedures for operating on the outer, federal portion may not be spelled out for many months. There are many legal snarls ahead to delay development. There is still much to be learned about the technology of operating in the open ocean. But the greatest factor holding back a rush of drilling is cost.

Costs of offshore operation are enormous compared with normal land operations. For this reason a great many companies have prudently stayed on shore where the risks are lower and more calculable.

On the Gulf Coast, at least, far more money has been sunk in offshore oil than has been returned. Companies now planning new ventures there admit that they may lose their shirts.

Why, then, do any oil companies venture into these uncertain waters, particularly at a time when there is a surplus of oil in this country? Because they know that someday this oil will be badly needed; because the problems involved are a challenge to their ingenuity; because they have a gambler's chance for a good, if long-term, return on their investment; and because it is their business to hunt for oil wherever it may be found.

BUT it will be months before there is much new activity offshore, and years before actual production reaches imposing figures. The National Petroleum Council says that for the next 5 years the oil actually made available will be less important than the techniques developed and potential discoveries outlined. It has been estimated that offshore fields could never produce more than 3 to 5 per cent of the nation's oil supply.

There's oil beneath the whitecaps, and the oil industry, if permitted, will produce it when and as needed. But it will be a slow and costly process and nobody is going to get rich quick. This the public—and the tax collectors—should be made to understand.

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THIS WEEK

PORTABLE LANDING STRIP is provided for this helicopter of Humble Oil & Refining Co. in use in the marshy areas of South Louisiana. The "egg beater" has proved a useful tool in exploration work in difficult terrain and has come into extensive use along the Gulf Coast in the last 5 years. This one "roosts" on a landing barge moored aft of the exploration crew's quartering boat.

INTERNATIONAL.—Labor unrest indicated in Venezuela, pointing to demands for shorter hours and more pay when contracts expire in August. . . . Workers, among world's best paid, expected to ask 40-hour week with 56 hours' pay. . . . ¶Study indicates only 488,000 bbl. of oil shipped out of Iran since British departure from Abadan in 1951. . . . ¶Reports from behind Iron Curtain indicate big increase in Hungarian crude production. . . . Present output set at 30,500 bbl. per day. . . . German agency estimates West German crude reserves at 247,000,000 bbl. . . .

PRODUCTION.—NPC committee places U. S. reserve producing capacity at 914,000 bbl. of crude daily as of January 1. . . . Further expansion needed, however, in spite of this excess, group concludes. . . . ¶Spraberry field operators await Texas Supreme Court ruling on shutdown order of Texas Railroad Commission. . . . Ruling could result in complete reopening of field, complete shutdown, or continuation of present situation in which only nonflaring operators may produce. . . . ¶New plan for secondary recovery in Kelly-Snyder field of West Texas proposed during hearing on field rules for proposed huge water flood. . . . New plan would inject gas to expand gas cap and raise reservoir pressure, together with water injection on field's flanks. . . .

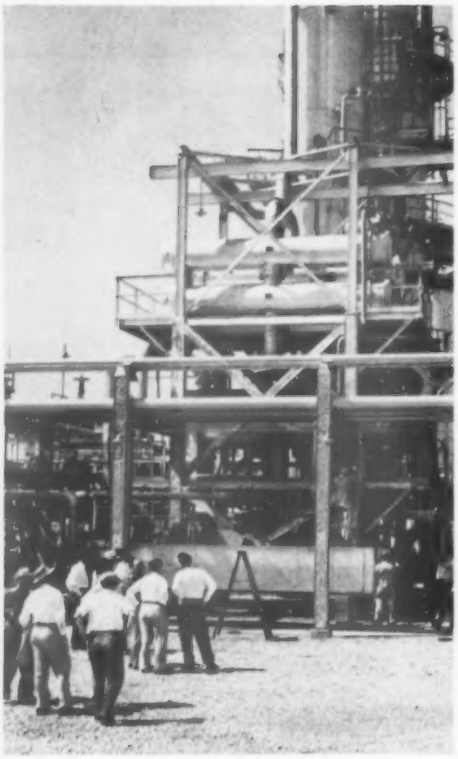
TIDELANDS.—NPC's submerged-lands committee estimates after 6-month study of offshore oil possibilities that no more than 170,000 to 200,000 bbl. daily of additional production could be developed off the coasts of Texas, Louisiana, and California in 5-year period after way is cleared for resumption of operations. . . . This figure could be attained only with favorable political atmosphere, adequate price, and sufficient materials and manpower. . . . In view of this, NPC thinks actual oil and gas made available during this period will be less important than the techniques developed and the potential of discoveries made. . . . ¶Wrangle over federal vs. state management of Continental Shelf beyond state boundaries ties up Senate Interior Affairs Committee. . . .

ACTIVITY.—Production of crude and lease condensate averaged 6,343,850 bbl. daily for week ended May 30, down 3,100 bbl. daily. . . . ¶Well completions for the week totaled 941, up 6 wells from same week last year but down 42 from previous week. . . . Wildcat completions increased 19 wells for the week to 236. . . . ¶Rotary rigs operating in United States increased 54 rigs during the week ended June 1 to 2,585. . . .

TRENDS.—Primary stocks of the four major products increased 4,086,000 bbl. for week ended May 30 for the first important gain of the season. . . . Refinery runs averaged more than 7,000,000 bbl. daily for the first time since March. . . . The average of refinery runs for May was less than 1 per cent under the average for the first quarter.

GOVERNMENT.—Justice Department withdraws objections, judge approves shift of civil cartel suit against five major companies to New York. . . . ¶Department also approves cooperative agreement under which companies operating abroad may work together to meet shortages without fear of antitrust prosecution. . . . ¶District Judge upholds authority of Colorado conservation body to halt flaring in Rangely field. . . . ¶Leaders in administration, Congress agree no quotas shall be placed on imports this year. . . . Bureau of Labor Statistics begins survey of refiners to determine supply of chemists and chemical engineers in the event of a full-scale mustering of reservists. . . . Administration to resist any plan for international commodity agreements, Wormser declares. . . .

Visiting refiners . . .



. . . Examine new facilities . . .

. . . Discuss program

Problems Solved

Here's how a small independent met the octane challenge and also found a way to get more gasoline from its crude

John C. Reidel

EL DORADO, Kans.—How a small, integrated company can whip its octane problem and obtain an increased gasoline recovery is demonstrated effectively in the modernized plant here of El Dorado Refining Co.

El Dorado solved its twin problem by addition of a 4,300-bbl. U.O.P. fluid cat cracker and maximum utilization of existing equipment, a move which boosted daily throughput capacity from 9,500 to 12,000 bbl. Enough cushion is still left in the cat cracker capacity to permit an increase in throughput to 15,000 bbl. per day with further modifications in the crude distillation equipment.

Like many small refiners, El Dorado's gasoline-quality problem had been growing increasingly acute. The rapid spread of catalytic cracking, together with rising compression ratios in new automobiles, had boosted octane numbers to a level which created a serious competitive problem.

One possible solution was the purchase of outside blending stock to meet higher octane specifications imposed by Great Lakes Pipeline Co. for transmission through its line. El Dorado dismissed this as a stopgap measure.

Equipment selection . . . Another choice also was faced. The company could whip the octane problem either by catalytic reforming or catalytic cracking. Following a report by George Armistead, Jr., consulting engineer, El Dorado chose cat cracking because with it the company could obtain an increase in capacity as well as octane improvement.

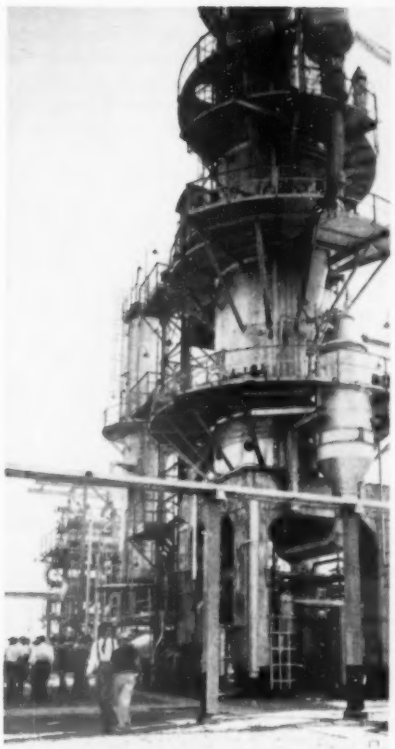
A 4,300-bbl. unit was selected because marketing possibilities and crude availability suggested a daily crude charge of over 10,000 bbl. daily. The crude-running equipment was modified to permit an increase to about 11,000 bbl., although the refinery has been actually running 12,000 bbl. per day, in current operation. The 1,300 bbl. per day cat poly plant was revamped to accommodate the new cat cracker. It was decided to maintain the thermal cracker for standby and to control production of middle distillates as dictated by market conditions.

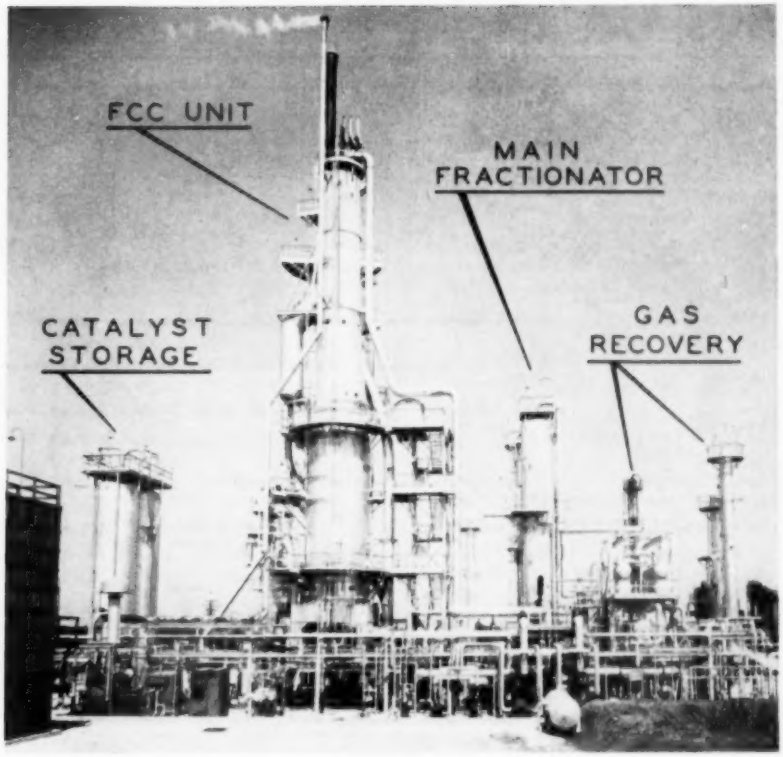
Much of the cost of the new expansion went into auxiliaries, such as a new water cooling tower, additional tankage, and new water supply. El Dorado Refining Co., in a joint venture with Skelly Oil Co., whose refinery is also located in the El Dorado area, is aiding in the financing of the Satchel Creek Dam, a new water-supply source for the city of El Dorado as well as the two refineries.

The company's markets for products was also a major factor in selection of new process equipment. Refinery operation is primarily for production of gasoline. Currently, following the latest expansion, the yield of gasoline is about 60 per cent of crude-oil charge, middle distillates at 25 per cent, asphalt at 11 per cent, L.P.G. at 1 per cent. The middle distillates break down into: diesel at 3 per cent, No. 1 fuel oil at 10 per cent, No. 2 fuel oil at 10 per cent, and kerosine at 2 per cent. Gasoline is blended with No. 1 furnace oil to provide tractor fuel.

Gasoline octane number was 80, with maximum lead, before installation of the cat cracker. It is currently at 83.5, with 1 cc. of lead.

Existing equipment . . . The new El Dorado operation was planned to tie the existing vacuum distillation unit





Octane requirements met . . . **. . . By this new processing layout at El Dorado's refinery**

The Journal photographs shown here were made during a tour of the refinery May 29. The trip was one of the highlights of the Western Petroleum Refiners Association regional meeting held in Wichita.

into the feed prep section, along with revamp of the existing atmospheric distillation unit. The vacuum unit is operated so that it can produce 85-100 penetration asphalt as well as good cat feed stock.

The thermal cracking unit was also revamped to crack light cycle oil, obtained from catalytic cracking, to make more gasoline. This helps to solve the problem of surplus No. 2 furnace oil resulting from cat cracker operation. The thermal cracking operation was divorced from the crude distillation. In fact, the crude unit, thermal cracker and cat cracker can be run independently to obtain necessary flexibility.

Construction . . . New facilities were constructed by Refinery Engineering Co., Tulsa. First purchase orders were written in December 1951. Foundations were started in March, 1952.

Major equipment items were delivered in August, and by October the major vessels were up and piping was 40 per cent completed. The new facilities went on stream in early January this year, only 13 months from drawing board to operation.

Background . . . The history of El Dorado closely parallels the growth and development of the oil industry in Kansas.

Organized in 1916, the company soon built its first refinery—a 600-bbl. topping still constucted in 39 days. It was barely completed before a program of enlargement was begun. Capacity was increased to 2,000 bbl. in 1917.

The first Winkler-Koch thermal cracking still was built in 1928, a pioneering step in the use of this type of equipment.

From its original 10-acre site, the refinery area has grown to 450 acres, including a tank farm with a storage capacity of 1,000,000 bbl.

Production . . . Besides refining, the company has expanded in other directions. El Dorado began in the early 1930's to develop its own production. In 1944 it formed its own crude-oil department, which now is larger than the refining department and includes a geological section, created in 1946 with headquarters in Wichita. At present the company has 91 producing leases embracing more than 10,000 acres and a backlog of undeveloped leases covering about 40,000 acres. Production is from 257 wells, most of which are in western Kansas. The company operates its own pipe-line system to gather crude from wells surrounding El Dorado.

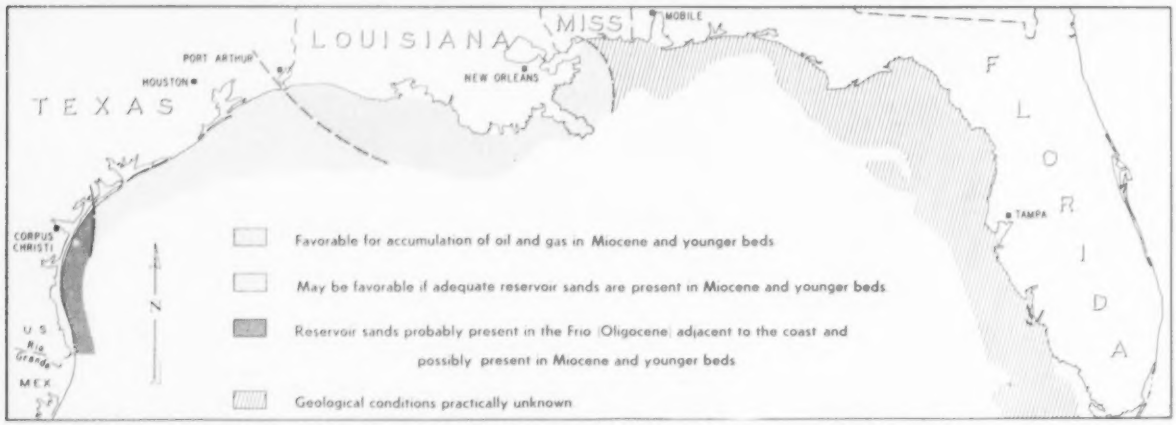
Marketing . . . To keep pace with its growing capacity, sales activities were reorganized in 1928 with the formation of a marketing subsidiary, K-T Oil Corp., which distributes products in western Kansas. Product distribution is through some 50 bulk plants, an equal number of service stations, and four supply warehouses. The company's primary marketing activities are concentrated in Kansas, Missouri, Iowa, and Nebraska.

Transportation . . . The company acquired a fleet of tank cars in World War I and now owns and operates 247 tank cars and a tank-car repair shop.

Management . . . President and general manager of El Dorado is T. A. Helling, who joined the company in 1918 as a stenographer in the traffic department. He has been general manager since 1921 and president since 1949.

George J. Peterschmidt, the company's only bookkeeper in 1923, is now vice president and treasurer, and H. J. Datin, who joined the company as a treater in 1919, is refinery superintendent, a position he has held since 1926. His assistant is H. L. Phillips, formerly chief chemist.

Sam L. Roberson is executive assistant of the company and served as chief construction engineer for the recent modernization and expansion project.



PROSPECTIVE PRODUCTIVE AREAS of the Gulf Coast Continental Shelf to a depth of 20 fathoms (120 ft.) as classified by the NPC submerged-lands committee.

Tidelands Outlook: Tempered Optimism

New techniques, potential of new discoveries may outweigh actual oil output during first 5 years, NPC body believes

Bertram F. Linz

WHAT will a renewal of offshore operations mean?

Actual oil and gas made available during the first 5 years after Congress settles the Continental Shelf question probably will be less important than the techniques developed and the potential of discoveries made during that period.

An additional 170,000 to 200,000 bbl. daily of crude oil and natural-gas liquids—only about 2 per cent of present domestic production—may be made available off the coasts of Texas, Louisiana, and California within that period, together with 600,000 to 800,000 M.c.f. daily of natural gas from the Gulf of Mexico. But even under the pressure of emergency in the event of war, industry experts do not believe that output could be greatly exceeded.

This is the crux of a report on tidelands development presented to the National Petroleum Council at its last meeting by a committee headed by L. S. Wescoat, president of Pure Oil Co. The committee's report was based on a 6-month study of the subject.

NPC was told that, assuming adequate economic incentives (including favorable price and business conditions but not a Government subsidy), adequate supplies of materials and manpower, confirmation of existing leases and the granting of additional leases, and freedom of operators to explore and develop, the above-mentioned volumes of oil and gas may be made available within a 5-year period. This production would be in addition to the output of California wells drawing from submerged lands but located onshore and on piers and of production from wells in protected inland waters along the Gulf Coast.

How much oil? . . . How much oil underlies the Continental Shelf is anybody's guess. Fantastic claims of possible recovery have marked the various debates on submerged-lands legislation in Congress, leaving the impression that whoever goes into the submerged lands will gain billions of dollars.

The committee refused to attempt to gage the potential of the underwater fields. But it warned that as operations go into progressively deeper waters, technological limitations may mean that only a part of the potential offshore resources will ever be developed. Even to get the oil that industry ingenuity will bring into reach will take many years, in which tremendous amounts of capital will have to be risked in exploration and drilling and, in the case of discoveries, in carrying on producing operations and paying royalties, investments, and expenditures that may be more or less than the value of the oil and gas produced.

While the entire 278,000 sq. miles of the nation's Continental Shelf may be a prospective petroleum province, present economics and technology are seen as limiting prospective drilling within the next 5 years to water depths of about 60 ft. in the Gulf and 50 ft. off California—areas of about 14,000 sq. miles off Texas and Louisiana and 300 sq. miles off the southern coast of California.

Some exploration may be undertaken in deeper waters or in other areas in the near future, but the problems involved will probably restrict their significance so far as development or availability is concerned within the next 5 years. Even in the shallow zones mapped out by the committee, it estimated that 30 per cent or more of the wells drilled may be expected to be dry holes.

With the enactment of the quitclaim tidelands legislation the way has been cleared for the resumption of operations inside the state boundaries — 3 miles in the case of California and Louisiana and 10½ miles in Texas. Most of the oil to be found off California will be within the state limit and that state has little interest in the outer Continental Shelf reserved as the sole property of the federal Government. Louisiana has oil both within and beyond its boundary, but Texas has had only one small discovery within its border and most if not all of the oil to be found off that state is expected to be in federal territory.

Prospects by areas . . . In the Gulf of Mexico, the generally favorable area for exploration extends from the Mississippi Delta to the Rio Grande in a submerged extension of the productive coastal plain of Texas and Louisiana. Production has been obtained from 25 structures off the coast of Louisiana and one off Texas. The area off Mississippi, Alabama, and Florida is vir-

tually unknown so far as geological conditions are concerned, but such work as has been done indicates the prospects of finding large accumulations of oil and gas are less encouraging to the east than to the west of the Mississippi.

In the Pacific the area of principal interest is off California, adjacent to the producing oil basins from Point San Luis southeasterly to the vicinity of San Onofre. The bed of the Pacific, unlike that of the Gulf which deepens very gradually, drops sharply at distances of 1 or 2 miles to 14 miles from shore.

Most of the structures favorable for the accumulation of oil found in the Gulf can be classified as salt domes, but the structures off California are highly complex and are difficult to test fully.

Present California law does not permit drilling from offshore platforms, and there is little information as to differences in costs or techniques from operations in the Gulf of Mexico.

There are, however, these three big problems, not encountered in the Gulf, which must be solved to drill off California:

. . . **Much deeper water** closer to shore.

. . . **Hard shale bottom** in the Pacific which makes it difficult to drive pilings to depths greater than about 8 ft.

. . . **Heavy ocean swell** which is almost continuous.

Costs are heavy . . . Practically every step necessary for exploration and drilling for offshore oil is far more expensive than upland operations, starting with the initial geophysical work, the committee found. Differentials in some types of cost range from two to seven times the onshore figure, but there are so many indefinite factors the committee found it impossible to develop any averages.

Some of the special facilites needed for operations in the Continental Shelf were cited in the report.

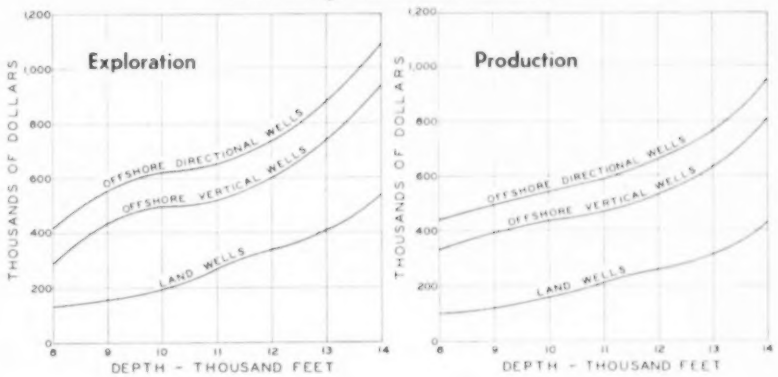
A shore base, costing from a minimum of $150,000 to $400,000 or more, will be necessary to accommodate the marine facilities required, provide for the loading of equipment and supplies, etc.

The drilling-platform cost will range from about $300,000 for a small platform holding only drilling equipment with everything else on a moored tender, through $775,000 for a main platform to support the drilling equipment and supplies and a separate platform as living quarters for the crews, to upward of $1,230,000 for a self-contained platform accommodating all rig equipment, auxiliary apparatus, supplies, and living quarters.

The drilling equipment used in offshore operations to date has been standard rigs modified for the exacting requirements of underwater operations. Heavy-duty rigs normally are used since a large percentage of the wells are expected to be drilled below 10,000 ft. Large pumps capable of developing 600 hp. or more are used with jet bits in drilling the sand and shale sections typical of the Gulf Coast.

Drilling Costs vs. Drilling Depths

(Cost of platform not included)



The report estimated that expenditures for platforms, equipment, etc., required for drilling 10 wells in 60 ft. of water with one rig could total $5,713,000, assuming that six platforms would be required and that at least one well on each platform was productive so there would be no opportunity to reduce costs by salvaging and reerecting a platform at another operation.

The cost of equipment, preparation of sites, etc., for a similar wildcat program on land is about $1,000,000.

Labor and other problems . . . There are other problems in offshore-drilling operations, however, which are not encountered or are less important in upland drilling.

Because two crews are on location, working 12-hour tours for 7 to 10 days before returning to shore for 5 to 7 days off, it is necessary to have competent supervisors and highly skilled labor which can be secured only by providing safe working conditions, adequate wages, dependable transportation, comfortable living quarters including recreational areas, and wholesome meals. The heavier overtime due to the work schedule will bring the cost of labor on an offshore rig to about $3,800 a week, compared to $2,300 on land.

Because the cost of platforms makes the drilling of single wells uneconomic a number of directionally drilled holes, much more expensive than vertical wells, are generally run from one platform. The cost of directional holes will run from 25 to 100 per cent higher, depending on the problems encountered in each operation.

Blowouts and fire are serious hazards on offshore installations, salt water and spray have corrosive effects on the steel in drilling platforms and equipment and machinery, and depreciation and obsolescence is much higher than on land. Weather also is a hazard, with drilling operations curtailed about 10 per cent of the time. Expensive radio facilities must be installed because of the lack of other forms of communication and the necessity for maintaining close contact between the platform and shore for operational and safety reasons.

Wildcat costs . . . Wildcat drilling costs offshore have been found to vary greatly, depending on the depth of water, depth of well, number of wells drilled from the same platform, type of well, etc., and in general will run from two to five times higher than for upland wildcats.

Not including the cost of the platform, which is nonrecoverable if a well is a producer, an 8,000-ft. exploratory well which would cost about $130,000 on land would run to $290,000 for a vertical well on the Continental Shelf and to $410,000 if directionally drilled from the same platform. A 14,000-ft. well that would cost about $515,000 onshore would cost offshore $940,000 if vertical and $1,090,000 if directional.

The committee found that 10 exploratory wells may be required for definitive tests of some large structures where several segments of the dome are barren of oil and gas. It placed the cost of drilling five vertical and five directional holes to depths ranging from 10,000 to 12,000 ft. at $6,700,000, plus $1,500,000 for five platforms in 60 ft. of water, or a total cost of $8,200,000, assuming at least one producer on each platform. Ten exploratory wells drilled to the same depths on shore would cost $3,200,000.

Development costs . . . If oil or gas reserves are found, development opera-

tions will be less expensive than the exploratory work but still very substantial. It will, for instance, be necessary to expand the shore base. For a 20-well development program on an offshore structure, four platforms would be required. Taking as an example 20 wells, 5 each to depths of 8,000, 10,000, 12,000, and 14,000 ft., the drilling cost would be $14,045,000 against $4,980,000 for a similar land development. Production costs, which offshore would not require roads or salt-water disposal but would immediately require a pipe line running possibly 30 miles, would run to $3,387,000 (of which $1,920,000 would be for the pipe line) against $906,000 on land.

Off California . . . To date only one drill site has been constructed off the California coast, and there is no experience on which to base cost estimates.

The report, however, carried what it said was a conservative estimate that it will cost 4 to 10 times as much to prepare for drilling an average well at sea as a similar well on land.

With the one exception, petroleum developments off the California coast have been limited to those that can be conducted by directional drilling from shore and from piers extending from shore. If the present prohibition on platform drilling is lifted or islands are built in bay areas and all questions relating to offshore operations are satisfactorily resolved, the committee estimated that around 100,000 bbl. daily of availability might possibly be developed within 5 years.

No estimate was made of the gas that might become available.

MID-CONTINENT

New Idea in Coking

Process using lower coking-chamber pressure will mean more cat-cracker feed and less coke, refiners are told

John C. Reidel

WICHITA.—A modified delayed-coking process designed to minimize coke formation while producing a maximum amount of feed stock for catalytic cracking was described here before the regional meeting of the Western Petroleum Refiners Association.

A paper prepared by J. H. Eppard, W. F. Sims, and F. D. Parker, of Blaw-Knox Construction Co., Tulsa, reported on the operation, which differs from similar coking processes primarily in that it operates at lower pressure.

The first unit to employ this process is now being built for McMurrey Refining Co. at Tyler, Tex. *(The Oil and Gas Journal, May 18, page 478).*

Pilot-plant figures cited for a 26°-gravity A.P.I. East Texas reduced crude showed a yield of 90 per cent liquid-volume cat-cracking stock. A 14°-gravity Mid-Continent type reduced crude yielded 70 per cent gas oil suitable for cat feed.

The process . . . The "feed preparation-decarbonizing" process as outlined by the authors would operate pretty much as a conventional delayed coking operation, except for the pressure on the coking chamber. The design calls for a pressure of 10 psig., with anticipated operation at perhaps 7 to 8 psig., compared with 25 psig. or higher in the conventional process.

The process is set up to employ preflash reduced crude being run from the topping unit to the flash zone of a fractionating tower. Also run to the fractionating tower are vapors from the coke drum. Fractionator liquid is taken through a heater to the coke drum. Overhead vapors from the coke drum are returned to the bottom of the fractionator to supply heat and aid in stripping virgin distillate.

Advantages . . . The authors said advantages of the process lie in the lower investment and operating costs which result from use of lower pressure and temperature to produce a minimum amount of coke. Size of the coke drum and heater can be reduced, they said, and mechanical decoking can be employed in place of hydraulic coking.

They also advanced the possibility of making the "decarbonizing" unit an integral part of the cat cracker feed-preparation section. Another possibility is to set up a petrochemical operation, reacting the produced coke with limestone to make acetylene which, it was said, would be competitive in price with acetylene produced by the Wulff process.

IN THIS HUDDLE at the technical and industrial-relations regional meeting of the Western Petroleum Refiners Association at Wichita were (left to right): R. W. Schrepfer, Jr., chief engineer, Vickers Petroleum Co., Inc.; F. W. McCurry, vice president in charge of manufacturing and research, Derby Oil Co.; J. H. Eppard, process engineer, Chemicals Plants Division of Blaw-Knox Co.; J. C. Day, executive secretary and treasurer, W.P.R.A.; and J. S. Wertz, chairman of the board, Vickers Petroleum.

Spacing Order Sought

OKLAHOMA CITY.—Eighty-acre spacing is being sought for Cherokee sand gas-distillate wells in Major County's Ringwood field by Great Western Drilling Co. and Great Western Producers, Inc.

Hearing has been set for June 12 by the Oklahoma Corporation Commission.

The applicants contend that a minimum of 80 acres is required to make wells to the 6,700-ft. reservoir economic. The first Cherokee completion was made last July. Principal production from Ringwood field is from the Manning zone, lying between 6,800 and 7,100 ft., a high gas-oil ratio reservoir discovered in 1945. This reservoir, with 60 wells, is considered virtually drilled up, and an order setting the spacing for the Cherokee sand is expected by field operators to renew drilling activity.

The Great Western companies also asked permission to dually complete wells in the Cherokee and Manning zones.

A request for a minimum price of 10 cents per M.c.f. for Cherokee sand gas is now pending before the commission.

Crude Line Revived

West Coast project backers under way on active campaign to obtain sufficient crude commitments to support line

AN active campaign to purchase enough crude oil to justify construction of a pipe line to Los Angeles is now under way in the Permian basin.

West Coast Pipe Line Co., which has been a paper corporation for nearly 10 years, has been revitalized and hopes to be able to announce plans for actual construction within a short time. It has formed a subsidiary, Exchange Oil Purchasing Corp., which now has agents in West Texas and New Mexico attempting to secure commitments from producers to sell crude to the line as soon as it is in operation.

Reports of these developments have been circulating in West Texas for 2 months and were confirmed in Austin last week by two officials of Exchange Purchasing in seeking to purchase state royalty oil.

They offered to purchase 15,000 bbl. per day of royalty crude from University of Texas and state school lands and to pay a bonus of $2,500 for a 2-year option on a 5-year contract to take the oil at 2 per cent above posted field prices. State royalty oil is now sold to the various operating producers at posted field prices, but the state may elect to take its royalty in kind instead of in cash.

Bascom Giles, Texas land commissioner, said that the School Land Board probably would reach a decision on the offer within 2 weeks.

The pipe-line agents, Alvin Lane and Bert Clardy, said they have concluded an option to purchase 17,500 bbl. per day of royalty oil from the State of New Mexico, and that they have signed up 12,500 bbl. per day of privately produced oil in the Permian basin. The terms of these deals were not made public.

These deals, if consummated, would provide 45,000 bbl. per day initial throughput for a line designed to carry 150,000 bbl. per day. It is understood that the backers of the project believe it is feasible to start construction as soon as about 60,000 bbl. per day is committed to the line.

Strong backing reported . . . There are persistent reports that the chief factor behind this latest attempt to build a crude-oil pipe line to California is El Paso Natural Gas Co. and that two large oil companies, one in California and one in the Mid-Continent, also are financially interested in the project.

The report that El Paso is supporting the project is substantiated by the fact that this company has contracts to purchase large amounts of wet gas in the Permian basin of West Texas and southeastern New Mexico to feed its gas-transmission lines leading to California. This gas cannot be produced without the accompanying oil, and at present there are not sufficient market outlets for Permian basin crude to support full production. The additional crude market which the West Coast line would open up in California would permit larger gas production.

Also, El Paso is planning a series of natural-gasoline plants in the Permian basin to treat this casing-head gas, and within a couple of years it may have upwards of 25,000 bbl. per day of natural gasoline, propane, and butane to market. These light products could be mixed with the crude-oil stream and extracted by California refineries processing the crude.

A proposal for a crude-oil pipe line from West Texas to the Los Angeles refining area was first broached during the war by a group of Texas independent producers. The present West Coast Pipe Line Co. was formed in 1944 with offices in Dallas. L. M. Glasco is president, and Burt E. Hull is vice president.

Stumbling blocks . . . Actual construction of the line has been delayed by lack of adequate financing, reluctance of Los Angeles refiners to agree to purchase Permian basin crude, and an apparent indifference of most West Texas producers. *(The Oil and Gas Journal, April 13, 1953, pages 74 and 75).*

Nevertheless, the backers went ahead with their planning. Ebasco Services, Inc., of New York, completed engineering plans for a 24 and 26-in. line from Midland, Tex., to Norwalk, Calif., near Los Angeles, a distance of approximately 960 miles. The line is designed for an initial capacity of 150,000 bbl. per day which could be increased to 300,000 bbl. with the construction of additional pump stations. The plan includes construction of a refinery at Florence, Ariz., midway between Tucson and Phoenix.

The New York investment firms of White, Weld & Co. and Union Securities Co. have agreed to float a bond issue for West Coast Pipe Line Co. when sufficient equity funds are available and construction is ready to start. During the period of steel shortages the Petroleum Administration for Defense issued West Coast a priority for the necessary line pipe on the ground that the project would aid national defense by making more crude available to California refineries.

Sufficient production? . . . Backers of the West Coast line believe that the Permian basin has adequate supplies of crude oil to make the line a success in spite of the recent completion of two big new carriers to the south and east—the Rancho and West Texas-Gulf systems.

Railroad Commission Districts 7-C and 8 in West Texas are estimated to have a producing capacity of around 500,000 bbl. per day above present allowables, and New Mexico is believed capable of producing around 25,000 bbl. per day more than at present.

In support of the West Coast project it is argued that regardless of how much pipe-line capacity there may be from the Permian basin, actual production of crude depends on market demand at the terminal ends of the lines. At present markets to the south and east are not absorbing all possible Permian basin production, while California has been short of crude oil.

Although Canadian crude will be available on the Pacific Coast by late fall, backers of the West Coast project believe that Permian basin crude will find a ready market at Los Angeles refineries. The present posted price of West Texas crude of 32° gravity is $2.36 per barrel, while Signal Hill (California) crude of the same gravity is posted at $3.12 per barrel. It is understood that the West Coast line proposes to charge an initial tariff of 50 to 60 cents per barrel. On this basis Los Angeles refineries would stand to realize between 50 and 75 cents per barrel more from Permian basin crude than from California crude.

There have been various estimates that California may have a chronic crude-oil shortage of upwards of 400,000 bbl. per day and that its biggest demand will be for high-gravity crude such as is available from the Permian basin. Supporters of the West Coast Pipe Line Co. cite this as an indication that the line can be a financial success and will open up permanent new markets for West Texas and New Mexico crude oil.

Scurry Question

Biggest flood still tied up in commission hearings

AUSTIN.—Whether the "world's biggest water flood"—that proposed for Kelly-Snyder field of Scurry County, Texas—would be given an official go-ahead, was still a question before the Texas Railroad Commission last week.

In the third hearing on proposed operating rules governing the now-unitized field, opponents of the majority plan proposed an entirely new program for secondary recovery in the 1,239-well, 48,768-acre field.

W. A. Moncrief and associates, who own properties on the east flank of the field, objected to the crestal water flood proposed by the Scurry Area Reef Operators Committee and proposed instead a program of gas injection along the crest of the reservoir with water injection on the edges of the field below the oil-water contact.

SACROC had proposed a line-type flood with injection wells down the crest of a ridge in the Canyon Reef formation, together with gas injection in the north end of the field *(The Oil and Gas Journal, May 11, page 82)*.

Spokesmen for Moncrief contended the SACROC plan is "risky" and "would be ruinous to this reservoir," that it would mean premature abandonment of the Moncrief properties, and that the plan as drawn offers Moncrief "no protection."

The substitute gas-injection plan, they contended, would mean an ultimate production of 1,580,000,000 bbl. of oil from the reservoir, compared to an estimated 1,462,900,000 bbl. under the SACROC plan.

The hearing was expected to continue this week, with SACROC officials being given an opportunity to present a rebuttal to the Moncrief testimony. There was no indication when a commission ruling on the SACROC application would be handed down.

Beaver Lodge, Tioga Merge

DALLAS.—Tioga Petroleum Corp. became a part of Beaver Lodge Oil Corp. May 31 under a merger agreement approved by stockholders of both companies recently.

Under the merger, Beaver Lodge acquires all assets of Tioga by issuance of one share of new Beaver Lodge stock for four shares of Tioga outstanding. Combined reserves of the two companies are estimated at 100 billion cubic feet of gas and 1.6 million barrels of oil and other liquid hydrocarbons. Combined holdings consist of approximately 35,000 net acres of oil and gas leases and about 16,500 acres of royalty and over-riding royalty in New Mexico, Oklahoma, Utah, and North Dakota. Also, Beaver Lodge now possesses income from 37 oil wells and 27 gas wells.

Critchell Parsons, Beaver Lodge president, said the company hopes to raise $2,500,000 for future drilling and leasing through a public offering of stock in September.

Decision Awaited

Spraberry shutdown suits heard by top Texas court

AUSTIN.—Operators in West Texas' vast Spraberry Trend Area field last week awaited a decision of the Texas Supreme Court on whether the entire field again would be shut in, whether only those operators flaring no gas would continue to produce oil, or whether the entire field again would be opened to production.

The court heard arguments in five suits questioning the validity of the shutdown order of the Texas Railroad Commission. There were three basic arguments before the court:

. . . **The Railroad Commission's** contention that the order is valid in its entirety, that good conservation practices require a halt to gas flaring, and that the order must apply to all wells to prevent producing wells from draining reserves of those shut in.

. . . **Nonflaring operators'** argument that they are conserving gas, that they should not be penalized because of failure of others to construct needed facilities, and that as the shutdown order is drawn, one operator, by failing to make arrangements for his gas, could keep a field shut in permanently.

. . . **Flaring operators'** contention that the entire order is unreasonable and confiscatory, that arrangements for gas utilization are being made as quickly as possible, that when this is being done flaring does not constitute waste, and that the order is either entirely valid or entirely invalid and must apply one way or the other to all operators in the field whether flaring or not.

The Supreme Court suit was on direct appeal by the Railroad Commission from a trial court which upheld the shutdown order in part but which granted permanent injunctions against the order to those operators producing oil without the flaring of natural gas.

The half-million-acre field was ordered shut in on April 1, and since that time has been operating at a rate less than 25 per cent of normal. At that time there were more than 2,200 wells in the field with a calendar-day production of about 82,000 bbl. and a gas production estimated at 280,000,000 cu. ft. daily, of which all but 60,000,000 was being flared.

The suits being heard by the high Texas court were filed on behalf of Rowan Oil Co. et al., Arthur Harvey et al., Plymouth Oil Co., Republic Natural Gas Co., and Blackwood & Nichols.

Round Top Injection Planned

ROYSTON, Tex.—A prolific, thick reef limestone reservoir—the Palo Pinto in Round Top field of Fisher County—may be subjected to gas injection to increase oil recovery and check the decline in reservoir pressure.

In a recent hearing before the Texas Railroad Commission, Round Top Oil Co., the applicant, told the commission that reservoir pressure has declined from 2,018 psi. when the field was discovered in 1947 to 340 psi., despite presence of a gas cap comprising 5 per cent of the reservoir.

General Crude Oil Co. and Texas Pacific Coal & Oil Co. concurred in the proposal to return gas to the 4,900-ft. reservoir. Operators plan to convert the structurally highest well on the west side of the field to injection.

The field, in which 136 wells have been drilled, has a cumulative production of 7,744,570 bbl. of 41°-gravity oil. Pay thickness of the oil zone is 110 ft. Average porosity ranges from 10.7 to 12.5 per cent, average horizontal permeability from 2.6 to 7.4 md., and connate-water saturation from 11 to 16 per cent.

New Black Plant Planned

PONCA CITY, Okla.—A $2,750,000 carbon-black plant will be constructed here for the annual production of 40,000,000 lb. of high-abrasion black from oil.

The plant is an enterprise of Continental Blacks, Inc., a new firm formed by Continental Oil Co., Robert I. Wishnick, New York, and Shamrock Oil & Gas Corp., Amarillo.

The carbon-black plant, which will receive feed stock from Conoco's Ponca City refinery, is expected to be completed by mid-1954, with construction to start this summer. Sale of products will be handled through Witco Chemical Co., New York.

Conoco also is coowner of Continental Carbon Co., which operates carbon-black plants at Eunice, N. M., and Sunray, Tex., and Continental Oil Black Co., operator of an oil-black plant at Lake Charles, La.

What's Oil's MER?

Industry had a reserve capacity of 914,000 bbl. daily on January 1, but further expansion needed, NPC body says

THE domestic oil industry was in a position to produce 8,159,000 bbl. daily of petroleum liquids in January 1953 without violating the concepts of efficient recovery.

That productive capacity for oil and natural-gas liquids represented the results of 2 years of intensive activity by the industry which expanded domestic availability by 859,000 bbl. per day, according to a study made by the National Petroleum Council for the Interior Department.

The January capacity included 7,465,000 bbl. daily of crude oil and 694,000 bbl. daily of natural-gas liquids. At the same time, production was running at 6,551,000 bbl. daily of crude oil and 653,000 bbl. daily of natural-gas liquids, leaving a reserve productive capacity of 914,000 bbl. daily of crude and 41,000 bbl. of natural-gas liquids.

Warning voiced . . . Although the NPC study committee, headed by L. F. McCollum, president of Continental Oil Co., confined itself to a mere statement of the facts, it did voice a warning that the current reserve capacity is not so great as to justify a letdown in the expansion effort. But, it intimated, it will be necessary for the industry to have assurance of government and economic support if the effort is to be continued on a large scale.

"It must be recognized that the necessary expansion of petroleum productive capacity will require unremitting exploration and drilling activities," McCollum said. "As has been stated many times in the past, the continuing provision of adequate supplies of petroleum, for civilian and defensive purposes, will require 'reasonable economic incentives, adequate materials, and a favorable climate for private investment.'"

Capacity by districts . . . The report broke the availability and production figures down by districts.

District 1, in January, had an available productive capacity of 49,000 bbl. of crude oil and 19,000 bbl. of natural-gas liquids a day, but was producing it all and had no reserve capacity.

District 2 had an availability of 1,238,000 bbl. of crude and 98,000 bbl. of gas liquids and was producing 1,181,000 bbl. and 89,000 bbl., respectively. It had a reserve capacity of 57,000 bbl. of crude and 9,000 bbl. of gas liquids.

District 3, with an availability of 4,686,000 bbl. of crude and 481,000 bbl. of natural-gas liquids, was producing 4,004,000 bbl. and 456,000 bbl., respectively, and had a reserve of 682,000 bbl. of crude and 25,000 bbl. of gas liquids.

District 4 had an availability of 394,000 bbl. of crude and 9,000 bbl. of natural-gas liquids. It was producing 327,000 bbl. of crude and 8,000 bbl. of gas liquids, leaving a reserve of 67,000 bbl. of the former and 1,000 bbl. of the latter.

District 5, including Elk Hills, had a capacity of 1,098,000 bbl. of crude and 87,000 bbl. of gas liquids, of which it was withdrawing 990,000 bbl. and 81,000 bbl., respectively. It had a reserve of 108,000 bbl. of crude and 6,000 bbl. of natural-gas liquids.

Plug for Liquid Nitro

It's the best explosive for oil-well shooting developed to date and it's a must for water floods, oil group told

LEXINGTON, Ky. — A veteran oil-well shooter reviewed his 23 years of field experience here last week and concluded that liquid nitroglycerine (LNG) is the most satisfactory explosive available for shooting oil wells.

Addressing the midyear meeting of the Kentucky Oil and Gas Association, G. C. (Shorty) Roberts, of Independent Eastern Torpedo Co., St. Elmo, Ill., said LNG has a speed of 27,800 ft. per second and is the most powerful explosive available today for the work.

Roberts, who has done most of his shooting in the shallow stripper areas of the Mid-Continent area, said the results of shooting with LNG are just as apparent at the bottom as at the top of a shot, regardless of the length or size of shells.

What it does . . . Effect of this explosive on a formation is a rapid jolting,

J. Ed Warren Honored for Government Service

Secretary of the Interior Douglas McKay, center, who also is Petroleum Administrator for Defense, is shown as he presented the Distinguished Service Award, highest honor conferred by the department, to J. Ed Warren, who will complete a year's service as deputy petroleum administrator on June 30. At left is Mrs. Warren. The ceremony took place in Washington May 26. Warren plans to leave the Government, June 30, and return to private operations.

during which a horizontal wave is expended which extends far out into the formation. This has been proven many times, Roberts said, by checking line input wells in different fields shot with LNG against those shot with other charges. Most operators believe, he said, that wells shot with LNG have shown a much greater recovery and a longer production life.

Citing the power and energy of LNG against the face of a formation, Roberts said a test using 1 lb. of the explosive yielded 156.7 cu. ft. of gas at a temperature of 6,280° F. and developed an energy of 2,120,000 lb. with a pressure of 150,050 psi. The explosion is so brief, he said, and the dissipation so great that the temperature rise in the wall of the hole or the casing is practically negligible.

The OWE, or Oil Well Explosive, Roberts said, is also a good explosive when used in the 100 per cent grade. This type of explosive is used a great deal in gas fields and in window shooting or where a section of Securoloy has been set and removed by the usual method. Also, liquid nitroglycerine 440E, or Red Glycerine as it is called today, has been developed in the past 2 or 3 years. Pressure unit volume is reduced and at the same time this explosive maintains a good detonation velocity rate.

Needed for flooding . . . In his paper, "Shooting Practices in Water Flood Areas," Roberts emphasized the belief that input wells being completed must be "shot" to obtain satisfactory injection rates. "Sand will take water for a period of time until it has absorbed all it can possibly contain within itself. Then after pressure starts building up, if the rate of injection is still unsatisfactory it is necessary to boost the pressure to maintain injection rates. This pressure increase endangers the project by a possible channeling occurrence which is surely a nemesis of water flooding. Why, then, should a risk like this be taken when a shot and a little cleanout time will eliminate that danger?"

Roberts cited two examples to illustrate the need for shooting input wells.

In one case, he said, a new waterflood project was completed with unshot input wells. Production failed to exceed 44 bbl. daily, a low rate blamed on poor injection rates which could not be increased by additional pressure for fear of channeling. Over a 7-month period all input wells were shot with 2-in. LNG shells through 4-in. casing cemented in the top of the pay. Today, Roberts added, the flood is up to 250 bbl. daily and has not reached its production peak.

On another project, he said, a deeper formation was tried with unshot wells and resulted in the same failure, except that injection pressures were raised as high as 1,400 psi. in an effort to obtain a satisfactory injection rate. The result was serious channeling and the project is now beyond recovery as far as a water flood is concerned, he declared.

Brake on Imports Urged

LEXINGTON, Ky.—Comparing the dangers of uncontrolled oil imports to those of an uncontrolled vehicle, Russell Brown, general counsel for the Independent Petroleum Association of America, tonight urged the necessity for brakes on imports.

Addressing the mid-year meeting of Kentucky Oil and Gas Association, Brown said. "Our state governments have appealed to these oil-importing companies to restrain their activities. Domestic oil producers have joined in this plea. Now we have the President of the United States, through the Secretary of the Interior, asking them to employ self restraint."

Brown traced the effect that excessive oil imports have had on the domestic industry and pointed out that "to whatever extent this activity causes the United States to become dependent on outside resources the security of our country is reduced."

Reserved Gas Outlook

Bright future hangs on solution to problems of high taxes, increased efficiency, and better selling, Burlingame says

KINGSVILLE, Tex.—The bright future of the natural-gas industry is not without a cloud or two on the horizon.

The entire industry must take steps to insure that the tax structure is not upset, that pipe lines become more efficient, and that competition of other fuels is met by better selling methods.

M. V. Burlingame, vice president of Texas Illinois Natural Gas Pipe Line Co. in charge of operations, told the eighth annual short course in gas technology at Texas College of Arts and Industries here that the financial situation is the most important now.

A price to the producer which is sufficient to encourage exploration is the only way to open up the vast potential reserves of gas in the nation, Burlingame said. Known reserves in the United States are about 200 trillion cubic feet, while reserves yet undiscovered are estimated at 300 trillion cubic feet, he said.

No single price can be set for all gas because of geographical situations, but the price in each area must be such that it will cover drilling and production costs and yet not overprice gas on a competitive basis with other fuels, he said.

Tax problem.—Tax-law provisions such as the depletion allowance should be continued, he said, but income taxes on the gas industry are not equitable in light of its risks, according to Burlingame. States can go overboard on additional levies affecting the gas industry, he declared. As examples he cited recent attempts to levy a $75 compressor-horsepower tax in Texas, an inch-mileage tax based on diameter and length of lines in Arkansas, a 5-cent per M.c.f. sales tax in Illinois, and the controversial gas-gathering tax in Texas.

Whether the taxes are levied against the producer, the transmission companies, or the distributor, he said, the industry suffers as a whole in the competitive field.

Regulation . . . In a critique of the Federal Power Commission, Burlingame said the allowed 5½ to 5¾ per cent return is not enough to attract new capital and that it should be revised upward to allow companies to expand.

Quick and adequate rate adjustments also should be allowed, he said. Suspension of hearings for 6 months without action, he declared, hurts the financial integrity of some firms and hinders their planning.

Another important activity of FPC, that of setting depreciation schedules, should be overhauled to bring it in line with current conditions, he said. For example, he declared, pipe-line depreciation is spread out over 30 years, but most contracts run only for 20 years, and this situation is unsound, he said.

Pipe-line efficiency . . . Transmission lines must be made more efficient in years to come, Burlingame said, suggesting that this could be accomplished in part by installation of modern prime movers.

The newly developed gas turbine is a straw in the wind toward this end, he said, for it provides improved thermal efficiencies at lower installation

costs, which, in turn, cuts the cost of transmission and improves the competitive position of natural gas.

Marketing areas require additional underground storage, he said, especially as the field price of gas goes up. The practice of dumping gas in the summer is becoming increasingly unsound, he added.

The competition . . . While the gas industry has been doing an excellent job, he said, it can't afford to rest because its competitors promise to become even more competitive.

Coal and electricity are continuously sniping at the natural-gas retail market, while areas near the sea can obtain tanker-shipped oil at prices as cheap or cheaper than pipe-line gas.

The coal industry, Burlingame said, is studying methods to lower mining costs by improvements in machinery and use of strip-mining methods where feasible. The coal institute is working vigorously on development of more efficient burning equipment, while the development of coal pipe lines, which move slurry of water and pulverized coal, promise lower transportation costs.

Meanwhile, he added, electric companies are providing electric ranges and year-around air conditioners which could eliminate gas entirely from these important fields.

Research Firm Bolstered

BARTLESVILLE, Okla.—Dr. E. H. Amick, Jr., assistant dean of engineering at Columbia University, and Francis W. Winn, process design engineer, have joined Fractionation Research, Inc., to head its technical organization, according to T. B. Hudson of Bartlesville, president of the corporation.

Dr. Anick received his B.S. degree from Montana State College, M.S. from University of North Dakota, and doctorate in chemical engineering from Yale University. He was United States representative on the committee in Germany working on decartelization of the I. G. Farbenindustrie after World War II.

Winn, a graduate of University of Oklahoma's chemical engineering school, spent four years in the Army Chemical Warfare Service. For years he did process design and economic studies with oil and oil-industry construction companies.

Fractionation Research, Inc., a nonprofit corporation representing 37 oil, natural gas, construction engineering, and chemical firms, is presently conducting a survey concerned primarily with industrial fractional distillation. Research and experiments will be conducted on full-scale-size equipment. All devices and techniques developed as a result of the firm's research program may be used by its member-stockholders.

Engineer Needs Surveyed

WASHINGTON.—A selected group of refineries are being canvassed to determine their present and future requirements for chemists and chemical engineers.

The study is being made by the Bureau of Labor Statistics at the request of the Defense Department which is concerned with the possible effects on the oil, rubber and chemical industries of a full-scale call-up of reservists in the event of war.

Although the gravity of the scientific manpower situation is widely recognized, no adequate information exists on the current and prospective demand for scientific personnel, it was pointed out by Ewan Clague, commissioner of labor statistics, and data are needed by the Government in planning scientific research programs and developing policies with regard to selective service deferments.

A study of the situation in the Philadelphia area has been completed and work is now under way in the New York and Cleveland areas, after which the Chicago and St. Louis areas will be studied.

GULF COAST

Barksdale Leases Offered

SHREVEPORT. — The Bureau of Land Management is inviting bids to be opened June 24 for oil and gas leases on two tracts of 1,042 and 824 acres, respectively, on the Barksdale bombing and gunnery range in Bossier Parish, near Shreveport.

The land was turned over to the Interior Department for leasing by the Defense Department last February, when it was determined that development was necessary to protect the Government's oil from drainage by wells on adjoining privately owned lands.

Under stipulations in the transfer only approximately 802 acres of the larger tract and 704 acres of the smaller can be occupied for oil and gas operations. The Government will require the lessee to drill certain wells at prescribed locations, protect the surface of the lands, construct certain fences, accept a limitation on the height of derricks, and remove his equipment if necessary because of military operations.

WEST COAST

How to Cut Drill Costs

Use the contractor to put down wells, Bell tells A.P.I. drilling session; it's cheaper because it's more flexible

D. H. Stormont

LOS ANGELES.—It is paying the oil operator in California to let the contractor do his drilling.

By so doing, the operator not only gets equal or better service at less cost than he can obtain with his own crews and equipment, he also achieves greater operational flexibility.

These statements were made by a drilling contractor, A. H. Bell, of Bell & Burden, Inc., at a drilling session during the annual spring meeting June 2-3 of the Pacific Coast chapter of the Division of Production of the American Petroleum Institute.

The greater operation flexibility, Bell said, is the first and most important advantage that an oil company derives from contracting its drilling work. This is because the operator can select at any time exactly what he needs from the equipment and experience pool offered by the contract-drilling industry.

Estimating that the 162 contractor-owned rigs, out of the 179 now at work on the Pacific Coast, have a combined capital value of $56,700,000, Bell said. "If the oil companies ran their own rigs they would no doubt have a combined investment at least 25 per cent larger than this due to flexibility requirements, or over $70,000,000. Thus by contracting their work they are saving a considerable amount of capital investment which can be used to better advantage elsewhere."

Basing his talk solely on Pacific Coast operations, Bell said that because the contractor is a responsible and experienced driller of wells, "operators should give him greater freedom of action, less limitations, and more responsibility."

He added that they also should let the contractor "assist in the development or modification of well programs, such as straight-hole requirements, di-

rectional drilling, etc., with the idea that over-all this sort of cooperation should result in better performance and lower costs which can be passed on to the operator."

The contractor's efficiency can be even further improved, he said, if operators will let multiple-well contracts wherever possible and standardize contract methods and forms, including work-progress reports.

If a standardized drilling-tour report could be agreed upon by contractors and operators it would improve the contractors' efficiency, he declared. Likewise the wide variation in drilling contracts as to form and context causes confusion and misunderstanding which could be eliminated by a standard drilling contract.

While not proposing that it is entirely suitable for California conditions, Bell brought out that the standard contract recently adopted in the Mid-Continent and Texas areas has been well received. The fact that 11,000 copies of the contract have been sold in the past few months, he said, "shows that agreement on standardization can be reached among a large group of people with diverse interests."

Drilling progress . . . Two other papers presented at drilling sessions described how two relatively new drilling techniques—jet rock bits and air drilling—are performing in California fields.

Based on the limited amount of air drilling which has been done by four California operators, K. M. Nicolson, Standard Oil Co. of California, declared "conditions favorable for air circulation and expensive for mud circulation" must exist before the method can be utilized economically.

In 14 surface holes drilled at the South Mountain and Oat Mountains fields, he said, the rate of penetration while using air was 40 to over 200 per cent higher than in comparable wells drilled with mud. In both instances severe lost-circulation conditions made drilling with mud impractical.

Water-bearing strata and sloughing formations are two conditions which tend to limit use of air drilling, he brought out.

Reverse circulation is one of the most promising means proposed to date for air drilling through wet formations, Nicolson said, for these reasons:

. . . High lifting capacity is obtained inside the drill pipe.

. . . Cuttings will not contact the sides of the hole or outside surface of the drill pipe.

. . . Fluid may be added to the air stream to improve the fluidity of cuttings if they tend to become sticky.

Current applications of high-velocity jet rock bits have generally resulted in improved bit performance at all California rigs having adequate hydraulic capacity, according to Gene Thompson, Humble Oil & Refining Co. Not only has an improvement in drilling rate been obtained, but also an increase in footage of 30 to 50 per cent over that given by conventional rock bits can be expected, he said.

Most California rigs, he said, have sufficient pump capacity and prime movers to effect a noticeable improvement in bit performance by adjusting the volume of mud circulated in relation to the nozzle velocity. Noting that the majority of jet-type bit operations are above 6,000 ft. for most rigs, Thompson said:

"Many operators have recognized the advantage of a properly designed hydraulic system and used sound foresight in repairing or replacing present pump equipment. Although the hydraulic advantage of larger drill pipe can reduce drilling time materially at the greater depth, the increased weight would also decrese the maximum depth currently attainable by the draw works.

"Since this limitation would particularly restrict many of the medium-power rigs with hoisting capacity already overloaded, some of the operators have chosen to increase the pump capacity as the first step in this long-term program."

Discussing pump requirements, Thompson said a study of single and parallel operations for the larger-size pumps in California indicates there is a noticeable increase in pump repairs when the circulating pressures exceed 1,500 to 1,600 psi. Assuming that 1,800 psi. is the maximum economical pressure, it is evident he said that "600 output horsepower pump capacity, 800 input horsepower based on 75 per cent efficiency, is about the optimum requirement for heavy or extra-heavy-power rigs on the West Coast."

While use of jet bits has become routine on many power rigs in California, he said, "it is evident that ultimate efficiency has not been attained; that the present bit performance at increased depths can be substantially improved by a persistent and practical approach to the development of jet-type rock-bit drilling technique."

Sunset Buys Placerita Wells

LOS ANGELES.—Sunset Oil Co. revealed last week it has purchased 360 acres of leases in Placerita Canyon field from Tevis Morrow for approximately $7,000,000.

The acreage has a gross production from 102 wells of more than 2,600 bbl. daily of 12° to 24°-gravity crude.

Morton A. Sterling, executive vice president of Sunset, said the company soon will launch a program aimed at increasing the field's production substantially. The plan involves drilling 35 additional wells on the property and using heat, diluents, and special pumping equipment in an attempt to double production of the low-gravity crude from existing wells.

The leases purchased from Morrow are located 2 miles east of Newhall, Calif. They produce from 500 to 2,400 ft. from a sand with an average net thickness of 230 ft.

The Placerita Canyon transaction is the third large purchase of producing properties made by Sunset in the past 2 years. The company paid $1,500,000 to Harry Long for Raisin City production in 1951 and $2,300,000 for Tejon Hills Co. properties in 1952. The company's gross production now exceeds 6,000 bbl. daily.

Industry Briefs

OKLAHOMA CITY.—The Oklahoma legislature has sent a bill to the governor permitting extension of oil and gas leases by the school land commission for 5 years where no production has been achieved. Under the bill, lessees can continue leases for $50 annual payment on producing gas wells, and $1 per acre rental.

FORT WORTH.—The annual federal-tax forum of the Mid-Continent Oil and Gas Association will be held at the Hilton Hotel here June 29 and 30. Three symposia on current federal taxation will highlight the meeting.

WINNIPEG, Man. — Fargo Oils, Ltd., controlled by General American Oil Co., is acquiring the properties of Franco Oils, Ltd. Plans call for Franco stockholders to receive 840,000 shares of Fargo stock for the properties.

TORONTO.—T. S. Johnston, president of Interprovincial Pipe Line Co., has announced that contract has been let to F. E. Shaw, Ltd., of Sarnia, for 7 miles of crude-oil line from the Canadian side of the St. Clair River to the Imperial Oil, Ltd., tank farm at Sarnia. It is expected the line, final link in the Alberta-Ontario pipe line, will be completed in August.

WASHINGTON. — Legislation repealing the present waiver of second and third-year rentals on oil and gas leases on lands not within a known geological structure of a producing field and on which no discovery has been made was favorably reported to the House of Representatives last week by its Interior Affairs Committee.

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Cartel Case Moved

Judge approves shift of scene to New York on company motion after Justice Department abandons its opposition

Bertram F. Linz

WASHINGTON.—The Government's so-called cartel suit against five major companies and their subsidiaries will be tried in New York instead of in Washington.

A motion by the company counsel for a change of venue was granted by Federal Judge Edward A. Tamm June 1 after Leonard J. Emmerglick, special assistant to the attorney general, told the court the Department of Justice was withdrawing its objections to such a move.

Emmerglick's action was definitely a surprise to the company lawyers, who had come to court prepared to discuss the setting of a date on which to begin argument on a number of motions, including that for a transfer.

Emmerglick explained that, even if the department was successful in its motion opposing a change of venue, appeals by the companies to the Supreme Court, which will shortly recess until October, would result in a delay of perhaps as much as 6 months. Therefore, he said, in the interest of saving time and in view of "existing world tensions" the department was dropping its opposition.

Efforts by the companies last year to have the grand jury investigation transferred to New York were unsuccessful but held up the inquiry for a number of weeks. The grand jury proceedings were dropped in April, when the present civil antitrust suit was substituted.

The department's opposition to a change of venue last year was based in part on the contention that the New York docket was so congested that it would be impossible to get to the cartel case for a long time. However, it is understood at present that in view of the national-security aspects other suits will be displaced to make room for the oil case next fall.

The department's second contention, that most of the witnesses and government records which would be required were located in Washington and therefore the case should be tried here, did not figure in the final moves on the motion to transfer.

With the issuance of the order transferring the case to New York, all proceedings in Washington came to an end. It will be up to the New York court to hear the motions which have been filed by the companies and to set a date for trial.

Key motion . . . The most important motion now left concerns the production of the documents demanded by the Government. Several conferences have been held between company counsel and Justice Department officials, the latter proposing a stipulation whereby the companies would submit documents located in the United States, but so far without results.

The major companies named as defendants in the suit are Standard Oil Co. (N. J.), Socony-Vacuum Oil Co., Inc., The Texas Co., Standard Oil Co. of California, and Gulf Oil Corp. When the suit was filed Atty. Gen. Herbert Brownell, Jr., indicated that other companies might be named after the Government has studied the documents it is seeking to secure.

The Government's complaint charged the companies with conspiring to violate the antitrust laws to restrain interstate and foreign trade, and monopolize foreign trade of the United States in petroleum and products.

The results of these violations, the department alleged, have been the unreasonable restraint of interstate and foreign commerce in petroleum and its products, the exclusion of other American oil companies from operations abroad and the opportunity to import petroleum into the United States, the artificial maintenance and increase of domestic market prices at which the defendants sell petroleum and products imported by them and products made by them from imported petroleum, and the increase and maintenance at high levels of prices charged by the defendants to agencies of the federal Government for foreign petroleum and products required for military and defense purposes.

How the case developed . . . The Government's attack on the operations of the companies which, in the first instance, entered the Middle East largely at the instigation and with the support of the State Department under former administrations, had its genesis in a Federal Trade Commission staff study made public last year, in which the companies were alleged to have engaged continuously in cartel arrangements over the past quarter-century.

On the basis of that report the Department of Justice instituted a grand jury investigation scheduled to start last September. As the Truman administration prepared to go out of office the President, on January 12, instructed his attorney general, James P. McGranery, to drop the investigation pro-

Board Road Beats Louisiania's Swamplands

It's taking 615,000 board feet of lumber, but this project will give Magnolia Petroleum Co. access to a drilling site in a marshy area of Cameron Parish. The road will be 7,200 ft. long and will connect an existing roadway with the location for the company's Abel West Heirs No. 4. The roadway required a fill 20 ft. wide and 3 ft. high, with a 15-ft. berm on each side to keep the roadbed from sliding. The project also involves construction of a mat for the drilling rig and a turnaround for vehicles.

vided the companies agreed to submit the documents sought by the Government in motions which they had been opposing.

McGranery's demands, for what company counsel felt was practically an admission of the Government's charges, were rejected in a heated meeting with department officials. The problem then was thrown into the lap of the incoming Republican administration, which substituted the present civil suit for the criminal case originally contemplated.

No-Prosecution Plan

Justice officials approve cooperative program under which firms abroad can meet shortages, furnish PAD information

WASHINGTON.—American companies operating abroad will be able to deal cooperatively with any shortages that develop and may furnish supply-demand data to the Petroleum Administration for Defense under a new agreement approved by the Department of Justice.

The agreement is similar to one entered into in June 1951. Former Atty. Gen. James P. McGranery withdrew his approval of that agreement and demanded its termination last year, over the protest of defense officials.

Renewal of the agreement has been under negotiation with Atty. Gen. Herbert Brownell for several months. His approval gives the participating companies immunity from prosecution under the antitrust laws and the Federal Trade Commission Act for their actions within the scope of the agreement.

The agreement, drafted under the terms of the Defense Production Act of 1950, provides for the establishment by Interior Secretary Douglas McKay, as petroleum administrator, of a foreign petroleum-supply committee. Fourteen oil companies have been invited by Defense Mobilizer Arthur S. Flemming to participate and other companies that qualify may join later.

The committee, and its subcommittees, are authorized to gather information for government use on petroleum requirements and supplies abroad. The agreement also sets up procedures under which participants may take joint action, under the direction of PAD, to alleviate any substantial shortage in world petroleum supplies which might have an adverse effect on the defense mobilization program.

"Petroleum supply," it is stated in the agreement, "is a world-wide matter, and shortages in one location necessarily involve adjustments in remotely distant areas. This normal interreliance is sharply pointed out in times of emergency."

Works well . . . Under the original agreement, the oil companies were able to cooperate in meeting the situation arising out of the shutdown of production and refining in Iran. The data on supply and demand which the committee furnished was of great value to the military, who urged that the work be continued when McGranery ordered the arrangement terminated.

Need for the agreement, Flemming said, is pointed up by the fact that the loss of any substantial current source of world petroleum supply can seriously jeopardize the interest of the free nations.

To that end, he said in a letter inviting the oil companies to participate, their cooperation "will assist in the accomplishment of our national defense program." The new agreement differs only slightly from the original one, covering more fully certain procedures and requirements.

Imports Agreement

Quota plan out if Congress follows leaders' decision

WASHINGTON.—Barring an upset in Congress, domestic oil and coal producers have lost their fight to secure quota limitations on oil imports.

Agreement has been reached by administration and congressional leaders that legislation extending the Reciprocal Trade Agreements Act shall carry none of the restrictive provisions proposed by Rep. Richard M. Simpson of Pennsylvania.

The bill, however, will provide for the addition of another member to the Tariff Commission to avoid deadlocks and for the speeding up of commission action on complaints against the reciprocal trade agreements by domestic interests.

Simpson's proposals called for strengthening of the peril-point and escape-clause sections of the act and for inclusion of a mandatory requirement that the President follow the recommendations of the commission, which he is not now required to do, as well as for a quota on oil imports.

Hearings held . . . The quota proposal was the subject of lengthy hearings before the House ways and means committee at which domestic oil producers urged that imports be limited to 10 per cent of domestic demand. The producers, however, refused to support a recommendation from the coal and railroad industries that a 5 per cent quota be imposed on residual fuel.

Spokesmen for the importing companies opposed any restrictions, on the ground the domestic industry was not being unduly injured and that any imbalance in the import situation would work itself out.

Expansion Progress

Industry attaining some goals, gaining on others

WASHINGTON. — The oil and gas industry's expansion program is moving steadily ahead, the Petroleum Administration for Defense reported last week.

The tubular-goods situation is still tight, with mill production slightly ahead of schedule. All available capacity is booked through the third quarter and is expected to be filled for the final 3 months of the year, according to Associate Deputy Administrator C. Eugene Davis.

The rate of drilling is running about the same as in 1952, with completions to May 15 0.9 per cent fewer than last year. But the 17,191 wells completed to that date were drilled with 9 per cent fewer rigs. There were 5.5 per cent fewer oil wells and 5.3 per cent more dry holes completed.

As of May 1, Davis said, 2,800 miles of pipe line had been laid and 13,000,000 bbl. of new tankage erected. A total capacity of 77,750,000 bbl. of new tankage is now expected to be completed by the end of the year.

The natural-gasoline program is aimed at increasing production by 193,000 bbl. daily, of which 74,000 bbl. is expected to be in operation by June 30 and all by the end of 1953.

Refinery expansion . . . The refinery program, for a total capacity of 8,300,000 bbl. daily by the end of this year, probably will fall short of the goal by 200,000 bbl. About 8,463,000 bbl. of the over-all objective of 8,800,000 bbl. is expected to be reached by early 1955.

Considerable difficulty is being encountered in the program to add 30,000 bbl. daily of alkylate production. So far, approximately 8,000 bbl. is assured, and negotiations for an additional 7,000 bbl. are in progress.

In aromatics, PAD has objectives of 130,000,000 gal. of benzene and 102,-

WATCHING WASHINGTON

Bertram F. Linz

Oil's Best Customer

Fifty-three million motor vehicles traveled nearly 517 billion miles last year, consumed nearly one billion barrels of gasoline and other fuels, and paid $3 billion in gasoline and license taxes.

There were 43,810,531 automobiles, 9,207,897 trucks, and 240,142 buses registered last year, according to the annual survey by the Bureau of Public Roads. The increase of 2.6 per cent over 1951, however, was the smallest for any year since the end of the war.

The bureau found that the number of motor vehicles has increased 53 per cent since 1941, while the mileage traveled has increased 55 per cent.

California is the first state to reach the 5,000,000 mark in registrations.

Estimates Too Modest

There may be a lot of things wrong with the oil industry, but it does have the likable trait of modesty. Every time it figures what it will be doing at the end of five years, it finds at the close of that period it has done much more.

For instance, back in 1948 the American Petroleum Institute made a study of productive capacity and made two guesses what it might be in 1953, its high figure being 7,200,000 bbl. daily. A National Petroleum Council committee has just completed a similar study and finds that domestic availability on January 1 of this year was 8,159,000 bbl. daily, or about 900,000 bbl. greater than the most optimistic estimate of the A.P.I.

Against this availability, the NPC found that the production rate in January was 7,204,000 bbl. daily, giving a cushion of about 955,000 bbl.

The NPC committee also was a bit on the modest side in intimating that it will be necessary for the industry to have assurance of government and economic support if it is to continue to do the exploration and drilling work required to keep reserves high and producibility expanding. In fact, producers who weigh the present rate of imports, size of aboveground stocks, and curtailed allowables against current operating costs are likely to consider this understatement as being entirely too modest.

Voluntary Action Favored

Administration officials are still convinced that the best way to deal with the imports situation is by voluntary action on the part of the importing companies.

Washington officials do not attempt to minimize the importance of the issue, and oil imports have been discussed by Interior Secretary Douglas McKay with President Eisenhower and the National Security Council.

In an appearance before the National Petroleum Council last month the secretary expressed the belief that the individual interests of each importing company will lead them to take the necessary action to keep their entries within the area that will preserve the health of the domestic industry and the security of the nation.

OGD Faces Cut Back

A few years ago Congress cut back the appropriation for enforcement of the Connally "Hot Oil" Act, and, thereafter, with about half as many investigators, the Oil and Gas Division increased its prosecutions by 50 per cent.

So members of the House Appropriations Committee looking for places to save money have suggested that another 50 per cent cut in the staff might again prove beneficial, a possibility also raised by D. Otis Beasley, administrative assistant to Secretary McKay, who is busily engaged in whittling down Interior Department spending estimates.

The Government could save some money in this operation if the OGD didn't have to do a lot of the preliminary work that could well be done by the state authorities. For instance, OGD checks the monthly producers' and transporters' reports against well allowables to see whether quotas are being exceeded by any producers in nearly 1,400 fields accounting for about 74,000,000 bbl. a month. That's a job that certainly ought to be done by the state, since the federal Government's responsibilities do not begin until illegally produced oil has moved across state lines.

000,000 gal. of toluene annually. The benzene goal has been reached, and the toluene goal has been exceeded by 50,000 gal. a year. About 432,000 tons of the 500,000 tons a year of sulfur programed has now been developed.

The lube-oil objective is 194,000 bbl. daily of high-viscosity-index oils. Existing capacity and programed expansion will provide about 182,700 bbl.

Exports Continue to Drop

WASHINGTON.—Exports of major oil products averaged 192,700 bbl. daily during the week ended May 8 compared with 242,300 bbl. a day in the preceding week, according to figures compiled by the Petroleum Administration for Defense.

It was the fourth successive week in which shipments declined after reaching a peak for the year so far of 361,800 bbl. daily during the week ended April 10.

As compared with the week ended May 1 decreases were registered in exports of all products except distillate, which showed an increase of approximately 35,000 bbl. a day.

Details of the week's movement, compared with the preceding week, and averages for the 4 weeks ended May 8 are shown in the accompanying table, in thousands of barrels daily.

	Week ended		Average
	May 8	May 1	4 weeks
Aviation gasoline	30.7	55.0	42.3
Motor gasoline	20.3	58.3	54.1
Kerosine	23.8	29.7	24.6
Distillate	77.6	42.9	79.4
Residual	40.3	56.4	54.4
Total	192.7	242.3	254.8

ROCKY MOUNTAIN

Rangely Order Upheld

DENVER.—Authority of the Colorado Oil and Gas Conservation Commission to order gas flaring stopped in Rangely field in northwestern Colorado has been affirmed here in a decision by District Judge Robert W. Steele.

The commission's order, issued about this time last year, directed producers in Rangely to cease flaring casing-head gas and to use it to maintain reservoir pressure.

A suit challenging the commission's authority to issue such an order was filed soon after by The Texas Co., Sharples Oil Corp., and Union Pacific Railroad. The companies contended in a 2-week hearing in February that the cost of a gas-injection program would be prohibitive.

NOW THERE ARE 51 TO SERVE YOU

It's always so easy to get your oil-field equipment from a Bethlehem Supply store. Wherever you are, there's almost sure to be one near by. During the past year new Bethlehem stores have been added to the long list, making 51 in all . . . in fields from Illinois to the Far West, and from the Gulf to North Dakota.

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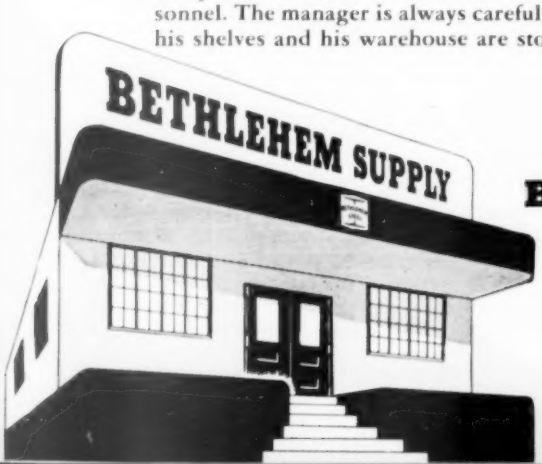
This is the type of treatment you can expect from any of Bethlehem's 51 stores in 11 different states. Pay us a visit; we'll be looking for you.



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BETHLEHEM STEEL

Iranian Shipments Low

Reports show Iran has succeeded in exporting 488,000 bbl. of oil since British shut down facilities in 1951

Dahl M. Duff

AVAILABLE information indicates a total of slightly under 500,000 bbl., or roughly 66,000 tons, has been exported from Iran since the industry in that country was nationalized.

All these shipments were made this year except for approximately 6,000 bbl. of crude oil carried in the tanker Rose Mary in June of 1952. The Rose Mary's cargo was turned over to Anglo-Iranian Oil Co., Ltd., after an injunction suit at Aden.

Reports show that seven cargoes have been lifted from Abadan and Bandar Mashur so far this year. Largest was the approximately 125,000 bbl. of products, reportedly gasoline, taken by the Japanese importing firm, Idemitsu Kosan, in the Nissyo Maru. All the other shipments were made by the two Italian firms, Supor and E.P.I.M.

Of the total of 488,000 bbl. exported thus far from Iran since the British closed down the facilities in the summer of 1951, approximately 300,000 bbl. has been in crude oil, and the remaining 188,000 bbl. in products. Most active of the two Italian exporting companies has been Supor. Anglo-Iranian has legal actions pending against both Italian companies as well as an appeal in its attachment suit against Idemitsu in Japan.

Iranian Government representatives are making every effort to increase the sales and widen the countries of destination beyond Japan and Italy. One major inducement is an offer to sell at 50 per cent below prevailing Persian Gulf price to United States, Japanese, and Italian buyers.

Efforts stepped up . . . Despite the opposition of Japanese Government officials, Idemitsu's tanker, Nissyo Maru, is heading back to Abadan to pick up a second oil cargo. However, Japanese purchases from Iran are not expected to continue. The Japanese Government, fearful of damaging its relations with Britain, has indicated it will not permit its nationals to barter Japanese goods for Iranian oil. Earlier, Tokyo said it would refuse future dollar allocations for Iranian oil purchases.

The firm opposition to the Iranian oil trade on the part of the Japanese Government makes it unlikely that Iran will be able to carry out plans to exchange oil for Japanese-built tankers. Iran feels it could step up oil sales if it were to provide tanker transportation.

The National Iranian Oil Co. has made public gross production figures for the first 3 months of 1953. The total was 5,047,000 bbl., or a daily average of 56,340 bbl. However, the figures include surplus products returned to the reservoir for which volumes were not reported. By months, the production figures were: January, 55,258 bbl. daily; February, 61,357 bbl. daily; and March, 53,000.

The Iranian agency is understood to be operating the topping plant in Masjid-i-Sulaiman field. Other reports indicate at least half the output is being returned to the reservoir. Net production currently is estimated at about 20,000 to 25,000 bbl. daily.

Line Completion Near

The 65-mile, 24-in. crude line being built by Basrah Petroleum Co. between the Zubair producing area and the Fao, Iraq, seaport terminal is scheduled for completion in October.

The new line will supplement the existing 74-mile Zubair-Fao line consisting of 64 miles of 12-in. for the upstream section and 10 miles of 16-in. at the Fao end.

Construction is being handled by company crews. Basrah is an Iraq Petroleum Co. affiliate. The pipe, 17,614 tons, is being delivered from the United Kingdom in 24 consignments.

Kuwait Plans Improvements

A program calling for $250,000,000 in public works and other improvements to be financed from oil revenue has been drawn up by the Government of Kuwait.

This sum is to be spent during the period 1952-57 on housing, water distillation, harbor improvement, roads, hospitals, and other projects. Construction is scheduled to begin in the near future on a power plant to supply urgent needs for electricity in the shaikhdom, and a school-building program is already under way.

The government originally drew up a 10-year program extending through 1962 for improvements to be financed from the greatly expanded oil income resulting from the 50-50 agreement reached late in 1951 between the government and Kuwait Oil Co., Ltd. Last year, a special government department, the Office of the Controller of Development, was established to carry out the program.

Kuwait's income is believed to be approximately $150,000,000 a year under the revised concession agreement. This is on the basis of present production of 750,000 to 800,000 bbl. daily and the current level of oil prices to which the shaikh's revenue is tied under a complicated formula for determining the f.o.b. crude price for royalty and tax purposes.

New Law in Works

Turkey hoping to present draft to Senate this fall

THE Turkish Government is moving ahead vigorously with the preparation of a new petroleum law which will open up the country to exploration and development by private foreign companies.

Max W. Ball, Washington, D. C. consultant who has been retained to draft the measure and advise the government on oil matters, has returned to the United States after an initial visit to Turkey.

A Turkish Government announcement said it is hoped to have the law ready for presentation to the Grand National Asembly when it reconvenes the first of November. In drafting the law, Ball will have the benefit of preliminary studies made by Safi Tezic, general counsel of the Ministry of Enterprises, Prof. Muvaffak Akbay, general counsel of the Mineral Research and Exploration (M.T.A.) Institute, and Dr. Necdet Egeran, adviser-in-chief of the petroleum division. Detailed analyses of the petroleum laws of Israel, Colombia, Venezuela, Peru, and the oil-producing provinces of Canada have already been made.

During his visit to Turkey, Ball had access to all the geological and geophysical information of the M. T. A. Institute, as well as to the preliminary notes on the forthcoming petroleum legislation. He was received by the president of the Republic, and had conferences with the prime minister and with Sitki Vircali, minister of industrial enterprises, as well as the various officials of the institute.

Activity . . . If acceptable legislation is

adopted, as now seems likely, Turkey is expected to be the scene of considerable exploratory activity next year. Four organizations: Shell, Jersey Standard, Socony-Vacuum, and Caltex, are already doing preliminary geological work of a reconnaissance nature in anticipation of the new legislation.

Yircali announced that similar letters of authorization for geological exploration will be issued to all qualified oil companies that apply.

Turkish officials have said that while the new legislation would make exploration in the country attractive to foreign operators it would at the same time protect Turkey's own commercial and financial interests.

Lebanese Program Outlined

The exploration rights which Pacific Western Oil Corp. and C. B. Wrightsman, Houston independent operator, have acquired in Lebanon *(The Oil and Gas Journal, March 23, page 177)* represents an undivided half interest in five exploration permits owned by Cie. Libanaise des Petroles, a Lebanese corporation, according to Pacific Western's recent annual report.

The permits cover an area of more than 700,000 acres. Pacific Western made no initial cash payment for these interests, but assumed exploratory and development obligations, and a test well has been started in Bekaa Valley.

According to reports in industry circles, Pacific Western and Wrightsman also are interested in an exploratory project under consideration in Egypt and are said to have had tentative discussions with authorities in France and Spain.

AUSTRALIA

Texan Planning Exploration

Robert Kamon, Cisco, Tex., geologist, is now attempting to work out an exploratory program for the 3,648,000-acre concession which he recently took out in eastern Queensland, Australia.

Kamon is a 1948 geology graduate of the University of Texas who is associated with his father, Rudolph Kamon, in Lucky Strike Drilling Co. of Cisco. He recently returned to the United States from a 5-month trip to Australia and has been seeking to interest oil men in the Southwest and the East in the possibilities of the Queensland area.

Concession terms provide a 5-year exploratory period with a 10-year renewal option. The agreement with the Mines Department of Queensland includes work obligations, and royalty is specified at 10 per cent if production is found.

The area is strictly wildcat territory not highly regarded in the past since the formations are reported to be mainly nonmarine. The concession covers part of the Maryborough basin and includes two large anticlinal features, Cherwell Creek and the Great Faulted Susan Creek anticline.

In a geological report prepared for his family's drilling company, Kamon said the only past oil exploration in the northern half of eastern Australia consists of one 3,990-ft. well southeast of Brisbane which encountered some free oil, and several wells under 1,200 ft. along the coast to the north.

LATIN AMERICA

Labor Dispute Looms

Top-salaried Venezuelan oil-field workers may demand higher wages, shorter hours in new union contracts

VENEZUELAN oil-field workers, already among the world's highest paid, are getting ready to fight for further boosts in wages and benefits when the present collective contract expires in August.

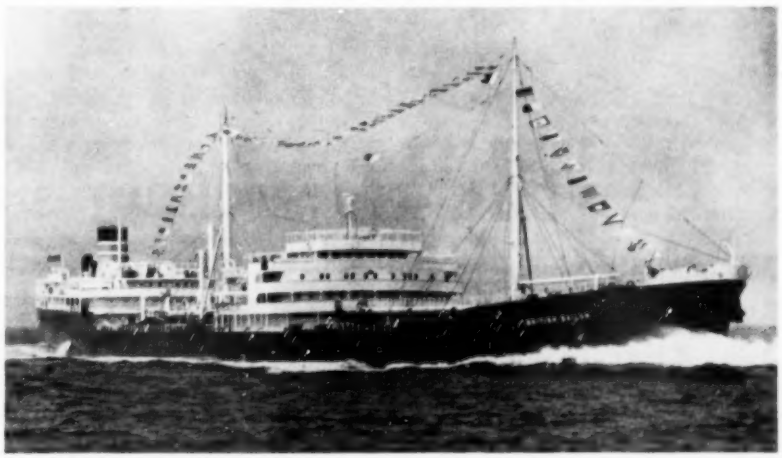
Dagoberto Gonzales, of the union, COFETROV, says their proposal will contain clauses looking toward salary raises, a 40-hour week with 56 hours pay, "family salary" formulas, greater union control of the company-operated commissaries, and so on.

The "Unified Committee of Oil Workers," which claims to represent close to 75 per cent of the organized labor of Zulia, where the most important producing fields of Venezuela lie, has announced that its proposals are already printed in pamphlet form. They are ready to be delivered to the Inspectorate of Labor in Zulia and the Ministry of Labor in Caracas. With the approval of these authorities, it will then be presented to the companies for their consideration.

It is true that the unions, which the workers are normally indifferent to, are having a spurt in membership, though there is room for doubt that they have achieved such gains as reported by the Unified Committee.

The last time labor and management sat down to discuss terms, in early 1951, their ideas were so widely divergent that the government finally stepped in and decreed a compromise solution. While far from meeting the demands of the labor side, it increased labor's cost to the industry by an estimated 10 per cent plus.

Present contract . . . The first collective contract, applying to labor-industry relations on a national scale, was adopted in early 1948, when the country was



A.I.O.C.'s "British Sailor" on Trial Run

This vessel is a new 32,000-ton tanker of British Tanker Co., the marine subsidiary of Anglo-Iranian Oil Co., Ltd. It is the British Sailor, the first of 13 tankers of this tonnage being built in British shipyards for the company. The view here was taken during the ship's trials.

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being administered by Accion Democratica, a political group which was overthrown by a revolution led by army officers later that same year. The party has subsequently been outlawed and branded as pro-Communist.

The 1948 contract raised the cost per worker to the industry to an average of $15 per work day, about $10 of which was take-home pay and $5 represented other benefits—subsidized commissaries, medical attention, retirement plans, housing, etc.

As to the effect of the 1951 decree, an official of the Ministry of Labor recently stated that it had added $2,400,000 to pay envelopes and $36,000,000 in total benefits over an 18-month period. One industry estimate placed the total rise in the price of labor at about 13 per cent.

Negotiation outlook . . . The "Unified Committee" has not yet decided whether to present their proposed collective contract to the companies individually or collectively, when permission to do so has been granted by the Ministry.

The companies for their part have announced their readiness to begin the discussions. Nonetheless, in its drive to enroll the most impressive membership possible, the committee has called on workers not yet signed up to think it over, "considering well the intransigent attitude the companies will adopt" in the coming negotiations.

It is safe to assume that what the newspapers are calling the "petroleum crisis," due to a 5-10 per cent falling off of production in recent months and the current U. S. Congressional consideration of limiting imports, will not soften the demands of union leaders. It will weigh heavily on those who feel that Venezuelan crude is pricing itself out of the market. And it will give the government—which in the end will probably have to intervene, in the pattern already established—a sound reason for not backing labor too far.

EUROPE

Report From Hungary

Big increase in production indicated by whisperings from behind Iron Curtain, but American oil men are skeptical

RECENT reports from behind the Iron Curtain in Hungary are that crude production in the Russian-controlled Hungarian oil fields has been pushed up to a level several times what it was a few years ago.

Much of this is attributed to a rush drilling and development program in Gellenaza field which the Communists opened up in June 1952. This field is about 10 miles south of Zalaegerszeg in a general area where pinch-out possibilities have been long known to exist.

Information in Vienna is that some 4,000 tons of crude are arriving daily at the Hungarian refineries. Reports are that the plants at Petfuerdo and Almafuezitoe, the latter a former Vacuum Oil Co. property, are producing 500 tons, or about 3,800 bbl. of products daily.

The Buzakeretye field is said to have been extended to the south, and rigs are reported in operation between the Hungarian frontier fortifications and the Yugoslav border. Portable drilling equipment is being used, and almost fantastic rates of penetration are claimed to have been achieved.

The Russian oil administration is attempting to find production in the general area lying between the Austrian fields and those in Hungary. As a result, exploratory drilling is being carried out south and southeast of Vienna.

Americans skeptical . . . Reports that Hungary is now producing 4,000 tons a day are received with skepticism by American oil men familiar with the country. This would be equivalent to about 30,500 bbl. daily, since Hungarian crude has an average gravity of nearly 40° A.P.I. and measures 7.63 bbl. to the metric ton.

The Hungarian oil industry was built up prewar by a company known as Maort, in which Standard Oil Co. (N. J.) held controlling interest. In 1948 the Hungarian Government arrested, imprisoned, and finally expelled the American executives, and in September of that year the properties were seized by state decree.

Production increases such as those now reported in Hungary would have to come almost wholly from new fields or major extensions. In the past, the Russians have shown a disposition to force production from flush fields without regard to conserving reservoir energy. In 1947, Hungarian engineers and the Maort management recommended stabilizing Hungarian output at 12,000 bbl. daily until new wells could be brought in.

However, the following year, with the Russian army in the fields, output was pushed to about 14,100 bbl. daily. Since then, Hungary has been generally believed to be producing around 10,000-11,000 bbl. daily.

Production Rising

Italian oil, gas output up sharply over last year

IN the first 3 months of this year, production of natural gas in Italy averaged 216 million cubic feet daily, an increase of 90 per cent over the average for last year, while oil production rose to 1,840 bbl. daily from 1,320 bbl. daily in 1952 and only 365 bbl. daily in 1951.

This and other information on the Italian petroleum situation were given in the recent annual report of the Italian state company, Azienda Generale Italiana Petroli. Operations in northern Italy are largely reserved to A.G.I.P. while gas transmission and distribution is in the hands of the affiliated Soc. Nationale Metanodetti. Gas production in 1952 was about 114 million cubic feet daily and in 1951, 70 million cubic feet daily.

In northern Italy the emphasis has been on the development and utilization of gas reserves which have been widely extended since the war by the state company. A.G.I.P.'s report said the length of gas lines in service increased during the year from 497½ to 1,290 miles. Next year, it said, the system is expected to total 3,100 miles and carry twice as much gas as at present.

New lines have brought gas to the Fiat factory in Turin, to Bologna, and to Verona from which city the system will be carried on to Mestre, Porto Marghera, and Venice. The first electric power station to operate entirely on natural gas is at Tavazzano near Milan and has alredy produced 160 million k.w.h.

Drilling successes . . . A.G.I.P. reported that of 77 new wells drilled last year, only 16 were dry. It said its refineries processed 1,200,000 metric tons, or about 24,000 bbl. daily, mainly of Kuwait and Iraq crude. It also noted that as a result of last year's agreement with Anglo-Iranian Oil Co., Ltd., it regained all its facilities and equipment in Eritrea from the British administrators and that it had 30 gasoline stations operating in this territory.

Natural gas produced in northern Italy is now in use in heavy industry, in chemical plants, including synthetic rubber, in textile factories, and in power stations. A.G.I.P. gas cylinder filling plants installed at four points on the Italian mainland and in Sicily with a

daily output of 16,000 cylinders. However, most of the gas is being used by industrial consumers, and only 5 per cent is taken in cylinders for use as motor fuel and for domestic consumption.

English Test Well Planned

A rig is being erected at Sereveton, south of Newark (Nottinghamshire), where D'Arcy Exploration Co., Ltd., Anglo-Iranian Oil Co., Ltd., prospecting subsidiary, is shortly to start drilling an exploratory well to a depth of about 3,500 ft.

The company has plans to drill several test wells in the East Midland area this year. One well will be a short distance from a test at West Drayton, near Tuxford, by the National Coal Board, where a small quantity of oil was recovered. This move follows a test of a similar National Coal Board well at Radcliffe-on-Trent nearby. Other test wells are to be drilled at Granby and Plungar about 5 miles from Sereveton.

German Reserves Estimated

Proven reserves of crude oil in West Germany are now officially estimated at 35,000,000 tons, or approximately 247,000,000 bbl.

The Federal Office for Soil Research estimates that in addition there is another 16,000 tons, or about 113,000,000 bbl. in the probable category. This total, both proved and probable, of 51,000,000 tons, or 360,000,000 bbl. represents an increase of 10,300,000 tons, or about 73,000,000 bbl., over the estimate made a year earlier. The increase of 25 per cent occurred despite production amounting to 1,800,000 tons, or 12,750,000 bbl. during 1952.

The increased reserves were due mainly to new discoveries at Boostedt and Ploen, Schleswig-Holstein, and in Alford and Lehrte, Lower Saxony, and to extensions in Suderbruch, Hemmelte-West, and Scheerhorn, all Lower Saxony, and Stockstadt, in the Upper Rhine Valley. Crude production in West Germany is expected to average close to 41,000 bbl. daily during the current year.

Gas Injection Under Way

The German company, Deutsche Erdoel-A.G. (D.E.A.), has begun work on a secondary-recovery project at Rickelshof in the Heide district in Schleswig-Holstein in West Germany.

The company plans to inject a total of about 15,000,000 cu. m. (about 230,000,000 cu. ft.) of gas into the Rickelshof gas cap to increase reservoir pressure.

Flue gas from the boiler house of the company's cracking plant near Hemmingsted will be used. The gas will be cleaned, dried, and moved through a 2-mile pipe line to the field. Rickelshof has had an cumulative production of 648,000 tons (about 4,800,000 bbl.) from a depth of 800-900 m. (about 2,600 to 2,900 ft.) The field was produced excessively during World War II with a resulting influx of water and gas into the formation.

International Briefs

The hydrodesulfurization unit being built at Shell's Stanlow refinery in England is expected to start operation early in 1954, according to an announcement from the London office of Lummus Co. The newly announced Shell hydrodesulfurization process provides for the catalytic extraction of sulfur from liquid feed stocks in the form of H_2S. The Stanlow unit will recover about 20 tons daily of elemental sulfur. Lummus has been authorized to offer the process to industry.

Standard Oil Co. of Brazil has been ordered to pay $1,000,000 in damages as a result of a collision between a train and one of the company's tank trucks in 1951 in which 50 persons were killed. Company attorneys are planning to appeal the Brazilian court decision.

The British firm, Petrochemicals, Ltd., is now manufacturing propylene glycol in commercial quantities for the first time in Europe. Heretofore, this chemical was of United States or Canadian origin, and due to the dollar scarcity, imports were restricted. Petrochemicals, Ltd., has a plant near Partington, near Manchester, which uses the Catarole process of Petrocarbon, Ltd., for the manufacture of a line of petrochemicals.

Venezuela Deep Test Below 13,000 Ft.

This is the Mysoa wildcat (left photo) (MB-1) of Venezuela Oil Concessions, Ltd. (Shell), about 13 miles inland from Bachaquero on the east side of Lake Maracaibo. The test is now drilling below 13,000 ft. More than $2,000,000 was spent on the operation, including the construction of a road through the jungle. Photo at right shows trailer living accommodations used by the American drilling engineers. In this same general area, in Andean foothills, Shell is now testing its LS-1387, another deep Cretaceous wildcat which went to 17,537 ft. to become the deepest well ever drilled outside the United States. On the other side of the lake is Creole's Alturitas 2, drilled to 17,265 ft. and unofficially reported to have obtained production from the limestone. (Wide World Photos).

Successful Middle East Operator

Neutral Zone gives up its first crude to Aminoil's veteran James MacPherson

MOST oil men would agree that James MacPherson, vice president and general manager of American Independent Oil Co., is entitled to the broad smile which spreads across his face in this recent picture.

Last March, the program which he has directed for the last 4 years in the Kuwait-Saudi Arabian Neutral Zone in the Middle East was finally capped with success when the Wafra 4 well made the discovery in what is expected to be a major new Persian Gulf oil field.

Not only is the discovery ranked as one of the most significant foreign oil developments of 1953 but it followed three somewhat discouraging years during which the company drilled five dry holes in this territory.

MacPherson is one of the best known oil operators in the Middle East. Before joining American Independent, or Aminoil, July 31, 1949, he headed up Arabian American Oil Co.'s organization in Saudi Arabia and directed the expansion program which this company launched in Saudi Arabia immediately after the war.

Kuwait headquarters . . . "Mr. Mac," as he is called, has his present headquarters in Kuwait Town where he serves what is considered to be the best coffee obtainable by a visiting American in the Middle East. Among other things, he likes a friendly poker game, good books, and the Bohemian Club in San Francisco in which he holds a membership.

MacPherson, now 62 and largely self-educated, has a wide fund of information on many subjects and doesn't usually hesitate to express himself on whatever he feels strongly about. One such topic is United States policy in the Israeli-Arab strife. He believes the country has alienated some of its best Arab friends by the handling of the Palestine situation.

MacPherson was born in Great Britain of Scottish parents. He finished his schooling at the age of 14, emigrated to Canada as a boy of 17, and finally wound up in Seattle. At the outbreak of the first World War, he returned to England, joined the British Army, and served in the Sinai Palestinian campaign. After the war, he went back to

Seattle and became an American citizen in 1925.

In 1919, MacPherson joined Standard Oil Co. of California in Seattle. He had various assignments in the western states and Mexico and subsequently became sales auditor, director of Pacific Public Service Co., and general manager of the purchases and stores department. During this time with California Standard, MacPherson worked with Ralph K. Davies, West Coast operator and now president of Aminoil.

MacPherson was transferred from California Standard to Casco (the forerunner of Aramco) in 1940, and served this company as secretary and treasurer, vice president, and director. During World War II, he served on the War Production Board as an assistant to Donald Nelson and also was on the U. S. Procurement Board which set up policies on renegotiation arrangements between the government and business. After his Washington assignment, he was sent to Saudi Arabia and the following year became resident administrator for Aramco.

G. H. Walkup has been transferred from East Texas to Riverton, Wyo., as field superintendent of Steamboat and Pilot Butte fields for British-American Oil Producing Co.

Dr. D. L. Yabroff has been appointed director of the newly created agricultural-research division of Shell Development Co. at Denver. The division will be responsible for development and testing of chemical products for use in agriculture. Dr. Yabroff will be assisted by **Dr. K. E. Marple** and **Dr. T. R. Hansberry.**

Marshall F. Stiles, Jr., has joined the petroleum-engineering department of Sinclair Oil & Gas Co. at Tulsa. For the past 6 months he has been district engineer in charge of the southern district of the Mid-Continent regional office of the U. S. Geological Survey at Shreveport.

Dr. Michael J. Rzasa has been named director of a new Cities Service Research & Development Co. laboratory to be opened at Tulsa about July 1. He formerly was with Stanolind Oil & Gas Co. at Tulsa.

J. R. MacGregor has been appointed research coordinator of petroleum products for California Research Corp. at San Francisco. He joined Standard Oil Co. of California, parent company of California Research, in 1925, and has been with the research subsidiary since its organization in 1944.

James R. Cowles has resigned as corrosion engineer for Oklahoma Natural Gas Co. to engage in consulting work and management of his firm, Agra Investment Co., Tulsa.

Thomas P. Jenkins, superintendent of Pacific Gas & Electric Co.'s gas operations in the Stockton division, has been named gas superintendent in the company's East Bay division at Oakland, Calif.

W. O. McConnell, Farmington, N. M., has been promoted from vice president to president of McConnell Drilling Co. He replaces **D. H. Byrd,** Dallas, who becomes board chairman. Byrd is president of Byrd Oil Corp.

Cecil Robinson has been named division geologist for Taylor Oil & Gas Co. at the company's new division office at Corpus Christi. He will continue to direct the district office at McAllen, Tex. **R. P. Gustafson** and **Joe Fallin** have been named geologists at the Corpus Christi office. **Bob Ross** has been appointed district geologist at the district office at McAllen.

Castle J. C. Harvey, head of the geophysical department of Deep Rock Oil Corp., Tulsa, has been named regional exploration manager of the company's south region. Area offices in the region are located at San Antonio and Wichita Falls, Tex., and Tulsa. **R. B. Hurlbutt,** assistant to the manager of the

PERSONALS

European Oil Men Visit U. S. Facilities

Representatives of western European nations, in this country under auspices of the Mutual Security Agency, are shown here as they visited facilities of Texas Eastern Transmission Corp. Left to right are S. A. Robertson, MSA, Washington; Tevik Fikret Suer, Ministry of Public Works, Ankara, Turkey; Arrigo Bohm, Italian Gas Co., Torino, Italy; Goffredo Bellini, Edison Co., Milano, Italy; Louis H. P. Deny, Bureau of Petroleum Research, Paris, France; R. H. Hargrove, president of Texas Eastern; Sante Tibaldi, National Pipeline Co., Milano, Italy; Henri J. F. Descazeaux, Gas de France, Paris; and Roger A. A. Odier, Gas de France, Paris.

geological department, has been appointed regional exploration manager of the north region, which extends north of the Oklahoma boundary. Area offices in Hurlbutt's region are in Wichita, Denver, and in Bismarck, N. D.

Paul F. Newton, production engineer for Sinclair Oil & Gas Co., has been transferred from Midland, Tex., to Tulsa.

Kenneth N. Houlette has resigned as senior geologist for Stanolind Oil & Gas Co. at Bismarck, N. D.

Bill Frielinghausen has joined the geological staff of Trigood Oil Co. at Casper. He formerly was a geologist for The Texas Co.

William Wallace Mein, Jr., has been elected president of Bishop Oil Co. **William Wallace Mein,** founder and retiring president, has been named to the newly created position of chairman of the board. The younger Mein has been vice president of Bishop since 1943 and a member of the board since 1938. **Edwin J. Valencia,** company treasurer since 1942, has been elected a vice president.

C. H. Carney has been promoted to senior process engineer for Humble Oil & Refining Co. at its Baytown, Tex., refinery, and **I. L. Kellogg** has been named senior mechanical engineer in the process group. Also at Humble's Baytown refinery, **John W. Lovli** was appointed senior engineer in the project-engineering section and **Carl J. H. Wahlstrom** was made senior mechanical engineer in the same section.

Stephen K. Frazier, geologist for The California Co., has been transferred from Shreveport to Bismarck, N. D.

Paul R. Schultz has been appointed assistant to the executive vice president of Stanolind Oil & Gas Co., Tulsa. He formerly was manager of the economics department. He came to Tulsa from Chicago in 1946 as chief chemical engineer for Stanolind and was named manager of the economics department in 1947.

Chester U. Burk, Oklahoma City, has been named supervising mechanical engineer for Continental Oil Co.'s production department in Houston. **M. L. Sweeney,** production clerk for Conoco at Ponca City, has been appointed director of methods analysis for the production department.

W. L. Tinslar, formerly a petroleum engineer for Gulf Oil Corp. at Penwell, Tex., has been appointed a petroleum engineer for Texas Gulf Producing Co. at Midland, Tex.

James S. Phillips, vice president of Columbia Gas System Service Corp., has been elected vice president, general manager and a director of Columbia's Charleston, W. Va., group companies. The group comprises United Fuel, six affiliated natural-gas companies and one oil company. Phillips has been in charge of purchases and business promotion for Columbia in New York since April 1949, and a vice president since 1951.

L. B. LaCour has been transferred from Dinero, Tex., to Corpus Christi as superintendent for Houston Oil Co.

Richard D. Hovey, geologist for Standard Oil Co. of California, has been transferred from Bakersfield to Oildale, Calif.

S. S. Seltzer, Jr., has been named president of Royal Petroleum Corp. and Southwestern Oil & Refining Co. of Corpus Christi, Tex., succeeding his father who died last December. **E. M. Morrison, Jr.,** was appointed vice president in charge of sales for Royal.

C. U. Daniels, president and managing director of Royalite Oil Co., Ltd., has been elected chairman of the Canadian Petroleum Association. Daniels also is first vice chairman of the board of directors of the Alberta division of the association. **Charles Hay,** president and general manager of Hi-Way Refineries, Ltd., Regina, Sask., and chairman of the board of directors of the Saskatchewan division of the association, was elected first vice chairman. **A. G. Bailey,** vice president and general manager of Bailey-Selburn Oil & Gas, Ltd., Calgary, and chairman of the board of directors of the Alberta division of the association, was elected second vice chairman. **G. L. Humphreys** was appointed secretary-treasurer and **R. H. C. Harrison** continues as president.

PERSONALS

Jim Quick has been transferred from Kansas and promoted to district geologist for Cities Service Oil Co. at Olney, Ill. He succeeds **Barney C. McCashland,** who has been transferred to Jackson, Miss., as district geologist. **Coxey Evans,** petroleum engineer, has been transferred to El Dorado, Kans., as production superintendent.

Charles E. Shaw, director of employe relations overseas for Standard Oil Co. (N. J.), has been approved by President Eisenhower as employers' representative to the thirty-sixth session of the International Labor Conference which opened at Geneva, Switzerland, June 4 and will run through June 27.

Earl F. English, vice president of Bechtel International Corp., San Francisco, and **Edward J. Hudson,** president of Hudson Engineering Co., Houston, have been awarded honorary degrees by Stevens Institute of Technology, Hoboken, N. J.

Van Thompson, Dallas, has been named vice president of Aztec Oil & Gas Co., wholly owned drilling and producing subsidiary of Southern Union Gas Co., Dallas. He will continue as manager of the exploration department. He has been associated with Southern Union since 1929 and came to Dallas in 1938.

Thomas Debevoise, Sewickley, Pa., has been appointed supervisor of inventory control for Peoples Natural Gas Co. A 17-year veteran of Consolidated Gas System companies, he has served in various capacities with Hope Natural Gas Co. and New York State Natural Gas Corp. Prior to his transfer to New York State Natural in 1951 he was assistant superintendent of Hope's Buffalo district in northern West Virginia.

D. F. Gerstenberger has been appointed vice president of the Ralph M. Parsons Co. at Tulsa. He will be in charge of activities in the Tulsa area and on the Gulf Coast. The company is engaged primarily in design, engineering and construction of refineries and natural gasoline and chemical plants. He formerly was southwestern district manager for Alcorn Combustion Co.

David H. West has been named acting assistant deputy administrator in charge of foreign activities for the Petroleum Administration for Defense. West, formerly director of the foreign supply and transportation division, succeeds **J. E. Brantly,** who has resigned.

J. T. HIGGINS

J. T. Higgins, manager of operations at the Richmond, Calif., refinery of Standard Oil Co. of California, has been named to succeed **C. E. Finney, Jr.,** as president of Salt Lake Refining Co. and Salt Lake Pipe Line Co., both Standard subsidiaries. Finney, who has headed the subsidiaries since they began operations 5 years ago, is retiring. Higgins assumes his new post July 1.

Robert E. Fortner has opened offices as an independent consultant at Princeton, Ind. He formerly was general manager for Spear Oil Co., Carmi, Ill.

Dr. Elihu Madison, The Texas Co., has been named as the new program director of the Petroleum Administration for Defense, succeeding **Charles J. Hedlund,** Standard Oil Co. (N. J.).

Dr. R. K. Stratford, research advisor for Imperial Oil, Ltd., Toronto, Ont., and president of the Ontario Research Council, has been presented with the honorary degree of Doctor of Laws by Queen's University, Kingston. He has been with Imperial since 1924.

Emery Clark has been appointed assistant to the vice president in charge of operations of Kentucky West Virginia Gas Co. He has been with the company since 1924.

Don R. Holbert has been appointed a junior petroleum engineer for Sinclair Research Laboratories, Inc., at Nowata, Okla. He formerly was junior production engineer for Carter Oil Co. at Cut Bank, Mont.

Mike Beckman, Natural Gas & Oil Corp., has been elected president of the Shreveport Geological Society for 1953-54. He succeeds **R. T. Wade,** Schlumberger Well Surveying Corp. Other new officers are: **Kenneth Keller,** Magnolia Petroleum Co., first vice president; **Robert J. Moffatt,** Carter Oil Co., second vice president; **Lane Sartor,** Pam-Am Southern Corp., secretary; and **Bill Nugent,** Pure Oil Co., treasurer.

John J. Keenon has been appointed superintendent of compressor stations for Kentucky West Virginia Gas Co., succeeding **C. V. Kishpaugh,** who has retired. He joined the company's engineering department in 1940 and was appointed assistant superintendent of compressor stations in 1950.

R. L. Adams has been appointed South Oklahoma district production superintendent for Continental Oil Co. at Ardmore replacing **William Drassen,** who has been transferred to Ponca City replacing Adams as North Oklahoma superintendent.

DEATHS

Joseph Henry Clack, 59, foreman in the light-oils department of Cities Service Oil Co.'s refinery at Ponca City, Okla., died June 1 at Ponca City.

Raymond Cross, 76, died June 1 at Columbus, Ohio. He was president of Ohio Fuel Supply Co., predecessor of Ohio Fuel Gas Co., and later became president of Ohio Fuel. He also was a former president of United Natural Gas Co., Oil City, Pa., and Pennsylvania Gas Co., and a former vice president of Columbia Gas & Electric Co., New York. At the time of his death he was chairman of the board of State Fuel Gas Co., Oklahoma City.

Sam Lewis, 64, Evansville, Ind., producer, died recently at Evansville.

William D. Kennedy, 27, seismologist for Kerr-McGee Oil Industries, Inc., Oklahoma City, was killed recently in an auto accident at Quinn, S. D.

B. D. Stevenson, 82, retired oil editor of the San Antonio Express, died May 28 in San Antonio, Tex.

Orville Palmer Callahan, 70, former secretary of the old Marland Oil Co., died in Oklahoma City, May 26.

Clement Davis, 59, Shawnee, Okla., independent oil producer, died May 29 at Temple, Tex., after an extended illness.

Ivar Hatlestad, geophysicist for Cross Oil Co., died May 28 at his home at Wynne, Ark.

Earl Ernest Young, 77, retired oil driller, died June 3 at his home at Tulsa.

NOTICE OF INTENTION TO DRILL OR RECOMPLETE
MISCELLANEOUS NOTICES
MISCELLANEOUS REPORTS ON WELLS
REQUEST FOR (OIL) - (GAS) ALLOWABLE
WELL RECORD
CERTIFICATE OF COMPLIANCE AND AUTHORIZATION TO TRANSPORT OIL AND NATURAL GAS
MONTHLY GAS REPORT
TRANSPORTER'S AND STORER'S MONTHLY REPORT

TYPICAL REPORTS required for various New Mexico oil and gas operations.

JOURNAL REPORT:

By Roy F. Carlson
West Texas District Editor

Know-How: New Mexico's Oil And Gas Conservation Procedures

This is the second in a continuing series of articles on rules and regulations of the various oil-producing states. First article, printed in five parts in late 1952 and early 1953, covered Texas operations. Coming up—Arkansas operations.

ALL matters relating to the conservation of oil and gas in the State of New Mexico are subject to the authority and jurisdiction of the Oil Conservation Commission of that state. Fundamentally the function of the commission is to prevent waste of oil and gas and to protect the correlative rights of all owners of oil and gas.

The commission was founded and its duties and powers prescribed by an act of the Legislature of the State of New Mexico in 1935. This act has since been amended in part in 1937, in 1941, and again in 1949. As prescribed by this act of the legislature, the commission has adopted a group of orders or general rules of state-wide application that outline its policies and set down rules of procedure that must be followed by the oil and gas industry in the state.

The majority of the rules and regulations of the commission are adopted directly from the legislative act with methods of procedure added to implement their use and effectiveness. The act is very specific in many of its provisions directed at preventing waste, suggesting methods of procedure and practices to be used in drilling or operating oil or gas wells.

In some cases, special rules are adopted by the commission and these prevail against the general rules in cases of conflict. Otherwise the general rules apply without exception.

No rule of the commission can be revoked, changed, renewed, or extended without public hearing unless excepted by some general rule. The commission may in emergency issue special rules that will apply for 15 days until a hearing can be held.

Hearing may be called upon the commission's own motion, or application of any operator or producer. Applications for hearing must contain a description of the nature of the order sought and the nature of the subject affected.

The general rules are subdivided into groups concerning drilling, abandonment and plugging, oil-production operating practices, natural-gas-production operating practices, oil proration

REFINER'S MONTHLY REPORT
GASOLINE OR OTHER EXTRACTION PLANT MONTHLY REPORT
OPERATOR'S MONTHLY REPORT
GAS-OIL RATIO REPORT
CARBON BLACK PLANT MONTHLY REPORT
CRUDE OIL PURCHASER'S NOMINATION
REQUEST FOR THE EXTENSION OF AN EXISTING POOL
OR
THE CREATION OF A NEW POOL

OTHER REPORTS to be filed with the Oil Conservation Commission by New Mexico oil men.

and allocation, gas proration and allocation, secondary recovery and pressure maintenance, oil purchasing and transporting, gas purchasing and transporting, and refining. A summary of required reports is also included here in table form.

These rules are given in this report in the same order as listed above, the first being those concerned with drilling.

Drilling—General Rules

Rule 101. Any person drilling a well in New Mexico must furnish and obtain approval of a bond up to $10,000 that is conditioned to provide for the plugging of a well if dry or when abandoned. If the well or wells involved are on state land the bond may also provide for payment of damages to livestock, range, water, crops, or improvements. The amount of the bond is variable, being set by the commission for each well, or it can be submitted as a blanket bond in the amount of $10,000 covering all wells drilled in the state by that operator.

The bond may be transferred from one operator to another upon acceptance of the transferee and approval of the commission. The transferee must file a new bond, or furnish assurance that the former bond is still responsible.

Rule 102. Five copies of Form C-101, the notice of intention to drill or recomplete, must be submitted to the district office of the commission in which district the drilling is to be done, prior to the commencement of drilling or recompleting operations. This form contains such information as the well's location, drilling equipment and contractor to be used, and the proposed casing program.

Rule 103. Each drilling and producible well must be identified by a sign legible at 50 ft. containing well number, name of lease, name of lessee, owner or operator, and the well location.

Rule 104. A well more than 1 mile from the limits of an oil or gas pool is defined as a wildcat, with closer wells following the regulations of that pool. A wildcat must be located on a substantially square tract of not less than 40 acres, which is a legal subdivision of the U. S. Public Land Survey, and must be within 100 ft. of the center of the tract except in three counties. These counties are San Juan, Rio Arriba, and McKinley, where the tract must contain at least 160 acres which is a legal subdivision of the U. S. Public Land Survey, and the well must be at least 660 ft. from the outer boundaries of such tract and 330 ft. from the inner boundaries.

Each well drilled in a defined oil pool must be drilled at least 660 ft. from the nearest producing or drilling well projected to the same pool, and must be on an approximate 40-acre tract. The well must be at least 330 ft. from a boundary of the tract.

Each well in a defined gas pool must be on a tract of approximately 160 acres, and cannot be drilled closer than 660 ft. to any outer boundary, 330 ft. to any inner boundary, and 1,320 ft. from any well drilling to or producing from the same pool.

Exceptions may be granted for oil-well spacing by the secretary of the commission without notice or hearing if topographical conditions require the change, or the ownership of all oil and gas leases within 660 ft. or the proposed location is common, or if all owners of land in such radius consent to the proposed location in writing.

Unit allowable for any oil well located on a tract of ½ acre more or less than the required 40 acres shall have its top unit allowable adjusted

Report Forms and Information—New Mexico Oil Conservation Commission

Form No.	Title of Form	No of copies	When to Be Submitted	Office for Submission	General Content of Report or Form
C-101	"Notice of Intention to Drill or Recomplete."	†5	Approval must be obtained before operations begin.	District office	Name and location of well, description of equipment used, contractor, depth, casing program, plat for wildcats.
C-102	"Miscellaneous Notices."	3	Approval must be obtained before miscellaneous operations are begun.	District office	Report for proposed change in drilling plan, plugging, squeezing, perforating, abandoning, plugging back, acidizing, shooting, drilling to greater depth.
C-103	"Miscellaneous Reports on Wells."	3	Within 10 days after subject operation is completed, 20 days for shooting or chemical treatment.	District office	Report drilling operations, test of casing, results of plugging and manner in which done, results and method of shooting or chemical treatment, and other miscellaneous operations.
C-104	"Request for (oil) (gas) Allowable."	4	After completion before an allowable will be assigned.	Same office as C-101	Complete information on location and completion of well and results of potential test.
C-105	"Well Record Form."	†5	Within 20 days after completion of well.	Same office as C-101	Record of mud, cement, casing, water sands, oil zones, location, tests, formation tops and thickness.
C-110	"Certificate of Compliance and Authorization to Transport Oil or Natural Gas."	4	Approval must be obtained before assignment of initial allowable.	District office	Name of operator, transporter, location, unit covered.
C-111	"Monthly Gas Report."	2	On or before fifteenth of month covering immediately preceding calendar month.	Hobbs and Santa Fe, 1 copy each	Volumes and sources of all gas and its disposition, with names of producer and taker of gas.
C-112	"Transporters and Storer's Monthly Report."	2	Same as C-111.	District office	Detailed report of sources and disposition of oil and other liquid hydrocarbons by all carriers or storers.
C-113	"Refiner's Monthly Report."	2	Same as C-111.	District office	Breakdown of crude oil handled and products manufactured, stocks, losses, and distribution.
C-114	"Gasoline or Other Extraction Plant Monthly Report."	2	Same as C-111.	District office	Detail of plant intake volumes, residue volumes and disposition, products manufactured and their disposition.
C-115	"Operator's Monthly Report."	(*)	On or before eighteenth of month following month covered in report.	(*)	Production of oil, water, and gas from each producing lease by well, nominations for next month, oil in storage, and disposition of oil.
C-116	"Gas-Oil Ratio Test."	2	On or before fifteenth of month following month in which well is scheduled to be tested.	Hobbs and Santa Fe, 1 copy each	Lease and well number, producing method, choke sizes, amount of production, volumes of oil, gas, and water, gas-oil ratios, test description.
C-117	"Tank Cleaning Permit."		Approval must be obtained prior to removal of tank bottom.	District office	Not necessary if bottoms are used on lease, reclaimed by operator and disposed through regular transporter, transferred to tank in same battery.
C-118	"Treating Plant Report."		On or before fifteenth of month following that covered by report.	District office	Record of volumes and disposition of products reclaimed from waste oil and emulsions.
C-119	"Carbon Black Monthly Report."	2	Same as C-118.	District office	Source of gas, and amount and kind of black produced.
C-120	"Injection Report."		Approval to commence.	District office	Description of equipment and formation involved.
C-121	"Crude Oil Purchaser's Nomination."	1	Five days prior to state-wide proration hearing.	Santa Fe	Volumes of crude desired from fields by commission districts. Must be notarized.
C-122	"Back Pressure Data Sheet."	3	New gas wells, and annually.	Santa Fe	Pressures, curves, and other data established by back-pressure test, with calculated potential.
C-123	"Request for Extension of an Existing Pool or Creation of a New Pool."	3	Twenty days after completion of a well outside an existing pool in the same formation.	Hobbs	Location of well and request for new pool designation, or inclusion within existing pool.

*Original to Santa Fe, one copy to Hobbs, one copy to proper district, one copy to each transporter involved. †Six copies if well is on state land.

on an acreage proportion. Top unit allowable for a gas well is adjusted in the same manner for tracts of 2 acres more or less than the required 160 acres. Upon notice and hearing the commission may fix different spacing requirements and larger acreage for drilling tracts.

Pooling of lots less than 20.49 acres is permissible if the lots are contiguous, part of the same basic lease, carrying the same royalty interest, and ownership of the units involved is common. Pooling applications must be accompanied by three copies of a certified plat showing the dimensions and acreage involved, ownerships of leases and royalty involved, and proposed well locations. Offset operators must be notified. The commission waits 10 days before approving such pooling, and will approve such pooling in the absence of objection. If there is objection, proper notice will be given, and a hearing held.

Rule 105. Operators must provide an adequate pit for the accumulation of drill cuttings prior to beginning drilling, in order to assure a supply of material for making mud for use to confine oil, gas, or water to native strata.

Rule 106. Passage of oil, gas, or water from one stratum to another

must be prevented during drilling. All water of possible value must be confined to its strata and protected by commission-approved methods, and must be shut off from the various oil and gas-bearing strata penetrated in drilling by use of casing and/or mud.

Rule 107. A string of casing must be set to protect the productive oil or gas stratum in a well. Also, other casing strings must be set to seal off other strata productive of oil, gas, or water. Surface casing must be cemented from the shoe to the surface, and cement must stand for 24 hours before testing or drilling the plug. Other cement must set for 30 hours.

Tubing must be run in all flowing wells and be set as close to the bottom of the well as practical. Tubing perforations must be within 250 ft. of the top of the pay unless otherwise authorized by the commission, and the bottom of the tubing bull plugged or restricted to an opening of less than 1 in.

Rule 108. A faulty casing string or cementing job must be repaired or eliminated or the well must be plugged and abandoned.

Rule 109. Proper precautions must be taken to keep high-pressure wells under control during drilling.

Rule 110. When outside strings of casing are pulled from any well, the annular space must be full of a mud that will seal off all fresh and salt-water strata or oil or gas-productive strata.

Rule 111. If the deviation from vertical of a rotary hole averages more than 5° in any 500-ft. interval, a directional survey must be run and filed with the commission before any oil or gas is sold from the well.

A directional survey must also be run in any well whipstocked for any reason other than sidetracking junk, straightening the hole, or controlling a blowout. Exceptions to this provision are had only after hearing before the commission.

Rule 112. Multiple-zone completion of any well is permitted only after a commission hearing. Application for the hearing must be accompanied by data showing location of the well and offset wells, and material on the source of supply involved.

Rule 113. If a well or its equipment is damaged by shooting or otherwise treating a well, that damage must be repaired, or the commission may require that the well be plugged and abandoned.

Rule 114. Oil wells must be cleaned into a pit or tank not less than 40 ft. from the derrick floor, and must be produced through an oil and gas separator of ample capacity. Any fire hazards must be 150 ft. from the well. Sufficient drilling fluid must be kept in the well to control subsurface pressures when coming out of the hole with drill pipe.

Rule 115. Well-head equipment with a working pressure at least 150 per cent of the reservoir pressure must be installed, and must permit adequate testing and control of the well.

Rule 116. Any occurrence of fire, breaks, leaks, or blowouts which destroy oil or gas must be immediately described to the commission. This notification must also describe what steps have been taken to remedy the situation reported.

Rule 117. Within 20 days of the completion or recompletion of a well a completion report, Form C-105, must be filed. This report describes the location of the well and gives a casing record, a mud and cement record, a description of pays, other formation tops, and a record of drill-stem tests.

Abandonment and Plugging of Wells

Rule 201. The commission must be notified of intention to plug a well on Form C-102, before starting plugging operations. When plugging an old productive well offset operators must be informed and an affidavit that they have been informed filed with the commission.

Rule 202. A well to be abandoned must be plugged in a manner that will confine all oil, gas, and water in their respective strata, either by the use of mud, cement and plugs, or a combination of these. Abandoned wells must be marked with a 4-in. by 4-ft. marker set in concrete. Seismic holes must also be plugged, but need not be marked.

A temporarily abandoned well must be plugged at top and bottom to prevent entry of foreign matter. But when drilling has been suspended for 60 days the well must be plugged and abandoned unless a permit is obtained from the commission.

Rule 203. If a well is to be used for production of fresh water, the top plug may be set below the water formation, if permission for this operation has been obtained from the commission.

Rule 204. The owner of any well drilled for oil, gas, or exploration purposes is responsible for plugging it.

Oil-Production Operating Practices

Rule 301. If an oil well is a wildcat or is in a field not exempt from this rule, a gas-oil-ratio test must be taken in from 30 to 60 days after completion or recompletion. Results of this test must be filed on Form C-116. Also, unless exempt, an annual gas-oil-ratio test must also be taken during the commission-prescribed interval. Results of this testing must be filed on Form C-116 not later than the fifteenth of the month following the survey period. Additional special tests may also be required.

During gas-oil-ratio tests, the wells must be produced at a rate no more than 25 per cent greater than the top unit allowable in the pool in which it is located. No well will be assigned an allowable greater than its official potential.

Rule 302. Results of a subsurface pressure test must be filed with the commission within 30 days after completion of a discovery well, and subsequent tests must be run during the month containing the anniversary date of discovery on all wells in a pool. Results of testing must be filed on Form C-103, along with pertinent data on the well and the calibration of the bomb used in testing.

Rule 303. Oil produced from separate pools must be kept separate in storage prior to marketing.

Rule 304. Multiple completions must be so operated that oil from the various sources of supply is kept separated.

Rule 305. All casing-head gas sold or transported off a lease must be metered and the amount reported monthly to the commission. Small quantities used in a field may be calculated for such report.

Rule 306. If no useful disposition of casing-head gas is available, all vented gas must be burned and the estimated quantity reported on Form C-115.

Rule 307. No device can be used in a well that will create a partial vacuum in an oil or gas stratum.

Rule 308. Sulfur or salt water in excess of 2 per cent of a well's production must be reported on Form C-115.

Rule 309. Oil cannot be taken from a lease until it has been accurately measured in tanks located on the lease. Tankage from eight units of the same basic lease may be centrally located.

Rule 310. Oil cannot be stored in open reservoirs. Dikes need not be erected around tanks unless they are in a city, town, or village, closer than 150 ft. to a producing oil or gas well, 500 ft. to highway or inhabited dwelling, or 1,000 ft. to a school or church. Where fire walls are required their capacity should be one-third greater than the tanks enclosed.

Rule 311. A cleaning permit must be obtained before any tank bottoms (in a lease tank used for storage of oil) may be cleaned. Form C-117 must be submitted for commission approval, reporting a gage of the tank bottoms and the estimated amount of oil in them. This amount of oil must also be included on Form C-115, the monthly production report.

Rule 312. A treating plant for reclaiming tank bottoms and waste oil can be constructed only after hearing and commission permission, and after

filing a $25,000 bond. The permit, if granted, is valid for 1 year, and is subject to revocation at any time after hearing. The permit entitles the operator of the treating plant to transport and move oil in compliance with regulations.

Rule 313. Wells must be operated in a manner that will reduce formation or emulsion and basic sediment as much as is practicable. Such basic sediment formed must be handled in such a manner as to prevent pollution.

Natural-Gas-Production Operating Practice

Rule 401. Daily open-flow potential tests must be made annually on gas wells from which the gas is being marketed. The testing must be done by the back-pressure method using four points in sequence from low to high, unless an alternate method be approved by the commission. Wells producing less than 400,000 cu. ft. per day need not be tested provided periodic shut-in pressures are reported.

Rule 402. Unless provided for by special pool order, shut-in pressures must be taken during the months of April and October. Test must be taken with a calibrated gage after a shutin of not less than 24 hours.

Rule 403. All natural gas produced must be measured by an approved method and reported by the purchaser of the gas, or by the producer if the gas is not delivered to a transporter.

Rule 404. Natural gas from a gas well cannot be vented, used to gas-lift oil wells unless processed and used beneficially after lifting, or used for manufacture of carbon black.

Rule 405. If gas is being injected into or removed from storage, the quantities must be measured and reported, but if no gas is wasted these other rules need not apply.

Rule 406. All regulations applying to natural gas and gas reservoirs apply to carbon dioxide as far as applicable. Special rules applying to carbon dioxide are available from the commission.

Oil Proration and Allocation

Rule 501. The commission prorates and distributes production among producers in a pool upon a reasonable basis and recognizes correlative rights. Special rules may be issued after hearing for any pool.

Rule 502. Over or underproduction may be corrected by under or overproduction provided that no producing unit may produce more than 125 per cent of its top daily allowable or 10 bbl. over the allowable except during testing. During any 1 month a well cannot overproduce more than 1 day's allowable production, and this overproduction must be balanced during the following month.

Rule 503. The commission will hold a hearing between the fifteenth and twentieth of each month to determine allowable production for the next month. Production will be allocated among pools on the basis of market demand, and among units in a pool on the basis of pool regulations.

A marginal well is allowed to produce its top unit allowable subject to Rules 301 and 506.

A well completed on or after the first day of a proration period is allowed to produce its top allowable subject to Rule 504.

Rule 504. An operator is allowed to produce as much oil as is necessary in the completion, recompletion, or testing of a well, provided application for such production has been approved by the commission. Oil produced is charged against the well allowable.

No well is placed on the proration schedule until Forms C-104 and C-110, the "Request for Oil Allowable" and "Authorization to Transport Oil" have been filed.

Rule 505. Allocation of production among pools is based on nominations for crude state wide, less the amount of oil produced by unallocated pools such as those composed of marginal wells. This remainder of state-wide production is divided among pools by use of a proportional or equivalent number of wells. All pools with a depth of 5,000 ft. or less have a proportional factor of 1, and therefore receive the same allowable per proration unit. This and other proportional factors are shown in an accompanying table.

To arrive at the normal proration unit allowable, the number of wells in each pool is multiplied by the proper proportional factor, and these figures are totaled for the state, giving a total equivalent or proportional number of proration units among which the oil is divided. Dividing the amount of production available for distribution by the total proportional number of proration units gives the allowable per proportional unit. This figure multiplied by the number of proportional units in a pool gives that pool's allowable.

The pool allowable is divided among wells either on the basis of the number of proration units or on the basis on special rules which may apply in the field, including gas-oil-ratio restrictions. Multiplication of normal unit allowable by the proper proportional factor will give top well allowable.

The depth rating of a field is determined by the depth to the casing shoe, or the top perforation in the casing, whichever is higher, in the first well drilled in the pool. Allowable for each pool is redistributed each month to provide for new wells. A well on which application for allowable is approved after the twentieth of the month is authorized to produce up to its top unit allowable.

Rule 506. The top gas-oil ratio is 2,000 cu. ft. per barrel unless special gas-oil ratios apply to the pool. A well is allowed to produce only that amount of gas obtained by multiplying the top unit oil allowable by the limiting gas-oil ratio. This in turn limits allowable oil production.

A marginal unit is allowed to produce the same volume of gas which it would be permitted to produce if it were not marginal.

Rule 507. Unitization may be permitted after petition, notice, and hearing.

Gas Proration and Allocation

Rule 601. As soon as practicable the commission will classify and define the limits of all known gas-producing pools.

Rule 602. If allocation of gas produced from a gas pool is necessary to prevent waste, the commission on the basis of nominations and other relevant data will fix allowables for the pool. Any gas pool that is being discriminated against through lack of access to gas transportation will be included in the proration schedule.

Rule 603. The proration period will be at least 6 months.

Rule 604. Allowables for the pools will be adjusted by the commission so that each proration unit can produce its fair share, and so that correlative rights can be protected.

Rule 605. Before a proration schedule is issued for a gas pool, the commission, after notice and hearing, will fix the proration unit for that pool.

Secondary Recovery and Pressure Maintenance

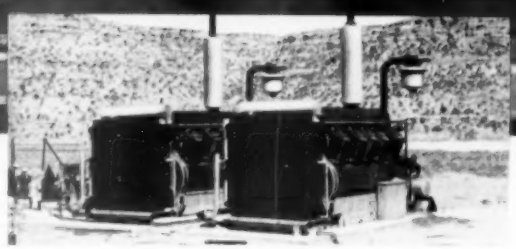
Rule 701. Injection of air, gas, or water into an oil reservoir is permitted only by order of the commission after hearing. Applications for permits must include a plat showing location of proposed injection well, offset producing wells and dry holes within ½ mile, and offset operators. The formations producing or that have produced must be named, along with others affected by injection, a log of the intake well, the intake well's casing program, amount of material to be injected, and the operator's name, must all be included in the application.

Rule 702. Wells used for injection must be cased or tubed to prevent leakage, and the tubing or casing must be set to prevent damage to other oil, gas, or water strata.

Rule 703. Immediately upon beginning injection operations the operator must notify the commission of the com-

BEAIRD-INGERSOLL-RAND

Packaged Compressor Plant



The two 550 h.p. 10 SVG packaged compressor plants at Largo Canyon station were put on stream immediately upon arrival, even before shelter was constructed. Each plant is completely packaged with all necessary components, including rugged steel base, Ingersoll-Rand gas engine-driven compressor, Young radiator, and all connections. Automatic controls permit the unit to operate without regular attendant.

EL PASO NATURAL GAS COMPANY's Largo Canyon compressor station is located forty-five miles from the nearest town in San Juan Basin, New Mexico. Yet installation of its compressors was made a simple matter by using Beaird-Ingersoll-Rand packaged compressor plants. For each of these 550 horsepower units is complete in itself and was shipped from the factory fully assembled. The first two are already on stream, boosting field gas into gathering lines for a gasoline plant. A third unit, which may be added later, will require no additional installation besides tying in suction and discharge lines. Packaging at the factory saved weeks of assembly time and sharply reduced the cost per horsepower, installed.

Let us tell you how complete packaging simplifies installation and cuts installation costs.

Arrive fully assembled —

HOW A COMPRESSOR STATION WAS EASILY INSTALLED MILES FROM ANYWHERE

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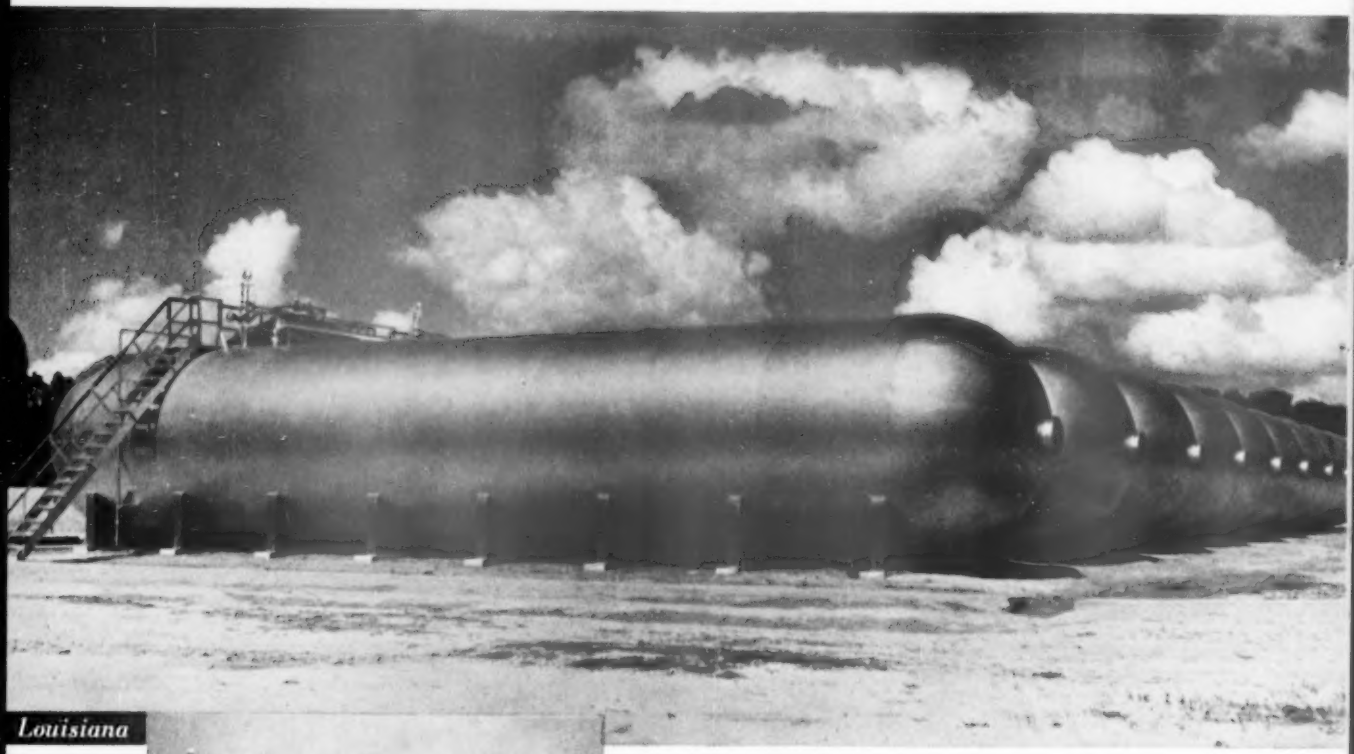
PACKAGED COMPRESSOR PLANTS · CAST STEEL FITTINGS · PRESSURE BULK STORAGE · ANHYDROUS AMMONIA EQUIPMENT · L P GAS SYSTEMS

Engineered For Safe Storage

BEAIRD PRESSURE STORAGE TANKS



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Here are a few of the installations of Beaird pressure storage tanks you'll find throughout the country—and there are many more. For Beaird has been manufacturing pressure storage equipment thirty five years. And during the past five years, Beaird production lines have been averaging one major size tank per day.

This demand for Beaird pressure storage tanks is no accident—it's the result of Beaird's advanced engineering design, constantly improved manufacturing techniques and thorough inspection and testing. That's why the firms which constructed these plants chose Beaird—that's why you too can have complete confidence in pressure tanks manufactured by Beaird.

Let us have the opportunity of discussing your pressure storage requirements with you.

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Packaged Compressor Plants

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mencement date, and within 10 days of stopping injection must notify the commission of the reasons for stopping. If an injection well is plugged, the commission must be notified, and the well plugged in the same manner as an oil or gas well.

Rule 704. Amount of oil produced, and amounts of fluid injected along with injection pressures must be reported monthly to the commission.

Oil Purchasing and Transporting

Rule 801. Sale, transportation, or processing of oil produced in violation of any statute of New Mexico is prohibited.

Rule 802. Pipe lines engaged in purchasing or transporting oil are termed common carriers, and must purchase all oil tendered to the line up to its capacity. If more oil is tendered than the line's capacity, then the line must take oil ratably without discrimination.

Unjust or unreasonable discrimination as to relative qualities of oils taken by the pipe line is illegal, and questions are to be decided by the commission. The common purchaser is authorized and directed to make 100 per cent purchases of oil from proration units producing less than 10 bbl. daily, unless the transporter is curtailed below that amount.

Rule 803. An operator may produce from a gas well the amount of condensate that is producible without waste, provided the producer has approval of the commission and that production is prorated.

Gas Purchasing and Transporting

Rule 901. Gas produced, sold, or transported in excess of the amount permitted by statute or in violation of any rule or regulation is illegal.

Rule 902. Gas purchases by a transporter must be common purchases, and the purchases must be made ratably among all producers in a field. Differences in price, if based on differences in quality, quantity, or pressure of gas are not considered unreasonable discrimination in the taking of gas. These provisions do not apply to gas in a storage reservoir that has been produced legally, casing-head gas from oil wells, or to persons purchasing gas principally for use in recovery or production of oil or gas.

Nothing in this rule requires a purchaser to take gas that cannot be economically and satisfactorily used by the purchaser.

Refining Operations

Rule 1001. The Refinery Report, Form C-113, must be furnished to the commission monthly by each refiner.

Rule 1002. Each operator of a gasoline, cycling, or other plant extracting liquid hydrocarbons from natural gas must file the Monthly Gasoline of Other Extraction Plant Report, Form C-114.

PROPORTIONAL FACTORS—DEPTHS AND ACRES

Pool depth range, ft.—	40-Acre prop. factor	80-Acre prop. factor
0 to 5,000	1.00	
5,000 to 6,000	1.33	2.33
6,000 to 7,000	1.77	2.77
7,000 to 8,000	2.33	3.33
8,000 to 9,000	3.00	4.00
9,000 to 10,000	3.77	4.77
10,000 to 11,000	4.67	5.67
11,000 to 12,000	5.67	6.67
12,000 to 13,000	6.75	7.75
13,000 to 14,000	8.00	9.00

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READING FOR PROFIT

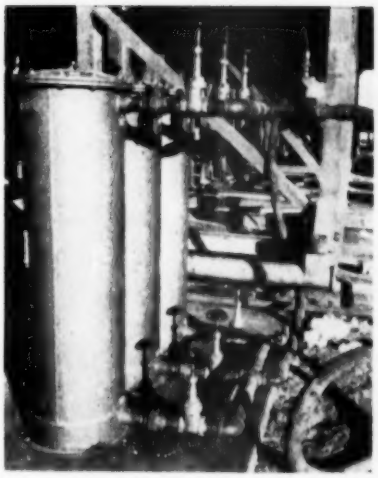
JOURNAL CHECK CHART

What is This Equipment?

THE three vertical cylindrical pressure vessels shown here were recently shot by the Journal's traveling field photographer, R. B. Ward. The vessels provide the subject of this week's puzzle picture.

What are they? Check what you think is the right answer in the appropriate square below, then turn to page 131 of this issue to see if your score is AAA-111, 100 per cent, on this equipment installation.

- ☐ Pressure tanks containing S.A.E. 10, 30, and 50 lube oils, with discharge piping to distribution points.



- ☐ Pressure-type water filters hooked up in parallel (three units), providing makeup water for portable plant operation.
- ☐ Test absorbers in experimental field use, where a new activated-type absorber is being examined.
- ☐ Natural-gas treater-filter in field use on drilling rig.
- ☐ Lube-oil filters (reclaimers) in field plant installation on a wildcatting operation in lower Gulf Coast territory.

BOOKS

IRA RINEHART'S 1953 YEARBOOK (Two volumes). Published by Rinehart Oil News Co., P. O. Box 1208, Dallas. 527 pp. $25 to subscribers of Ira Rinehart's Oil Reports, $35 to nonsubscribers.

This yearbook reviews operations of the oil and gas industry in 20 states during 1952. A forecast section, which takes the form of an illustrated 61-page symposium introducing Vol. 1 of the yearbook, includes exclusive area-by-area opinions of 12 geologists who have analyzed 1952 activity and results for indications of 1953 prospects. Another special feature is an article, "The Domestic Producer in 1953," by Charlton H. Lyons, president of the Independent Petroleum Association of America, devoted to such industry problems as steel, crude prices, and imports.

The bulk of the 2-in.-thick volumes is made up of the exploratory section which includes detailed reports on 1,987 discoveries, new pay openers, and major extensions in the Rocky Mountain area, Oklahoma-Kansas, Texas, Arkansas-Louisiana, and the southeastern states. Illustrations include 32 formation charts and 155 maps.

CELLULOSE — THE CHEMICAL THAT GROWS. By Williams Haynes. Published by Cellulose Products Department, Hercules Powder Co., Wilmington, Del., and Doubleday & Co., Inc., Garden City, N. Y. 386 pp. $4.

In this history of fact and legend the author relates the story of the cellulose industry from the age of Marco Polo to the present, and records the paradoxical and complex qualities of this useful chemical. It is the story of plastics, nylon, lacquers, lethal explosives, and even a cure for ulcers. Included is a concise glossary, a chronology of events and discoveries, and appendixes of statistical and technical data.

HYDRODESULFURIZATION . . .

. . . a catalytic process for upgrading high-sulfur stocks, such as straightrun and catalytically cracked gas oils and shale oils

by H. Hoog,* H. G. Klinkert,† and A. Schaafsma†

A "TRICKLE" hydrodesulfurization process is proposed for the production of low-sulfur middle distillates from high-sulfur stocks, such as straightrun and catalytically cracked distillates and shale oils.

This process shows the following features:

1. The application of the trickle technique—in which the feed stock is trickled in liquid form over a fixed bed of catalyst and in which a low hydrogen-recycle rate is applied—results in a saving of from 15 to 20 per cent in capital investment and operating cost in comparison with gas-phase hydrogenation.

2. A sulfur removal of from 85 to 90 per cent is easily obtained with both catalytically cracked and straightrun gas oils.

3. High-octane gasoline—obtained as a byproduct from catalytically cracked cycle oil—and hydrogen sulfide contribute materially to the economics of the process.

*Koninklijke-Shell (Royal Dutch-Shell) Laboratorium, Amsterdam, The Netherlands. †Bataafsche Petroleum Maatschappij, The Hague, The Netherlands. Summary of paper presented at midyear meeting, A.P.I. Division of Refining, New York, May 13, 1953.

These characteristics and the availability of low-cost hydrogen from catalytic reforming processes make trickle hydrodesulfurization an attractive process for the upgrading of high-sulfur stocks.

Development Work

Development work on the process has been carried out in a 30-in. reactor which contained three catalyst beds. Each catalyst bed was 6 ft. in height. Throughput through each reactor was 5 to 10 bbl. per day.

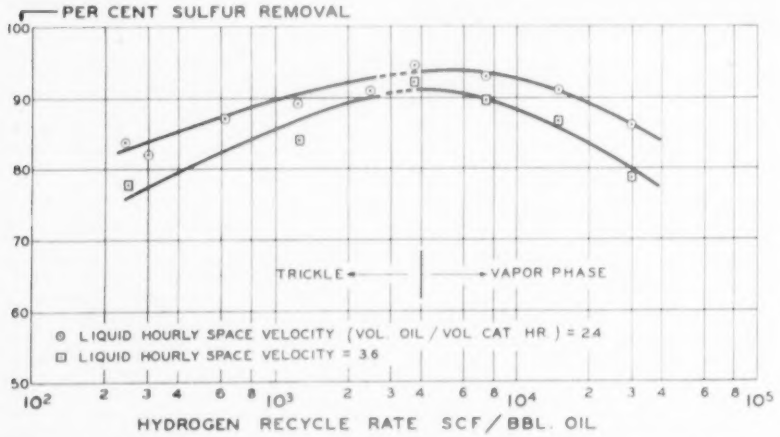
Hydrogen recycle . . . The experimental results given in Fig. 1 demonstrate that, under otherwise equal conditions, desulfurization is most complete at hydrogen-recycle rates corresponding to the break point between trickle and vapor-phase operation.

At hydrogen-recycle rates below the break point the desulfurization decreases, presumably because of the lower mass-transfer rate caused by the resistance of the liquid film on the catalyst surface. The decrease in desulfurization at very low hydrogen-recycle rates may be attributed to the lower hydrogen partial pressure and the higher hydrogen-sulfide partial pressure existing in the lower part of the reactor.

Economic evaluations on the basis of these results have shown that, when a comparison is made for a given sulfur content of the product, the cost of the small increase in reactor volume required is far outweighed by the reduction in cost of gas-recycle compressors and heat-transfer equipment. The overall capital investment required for the hydrogenation unit proper is in the order of 15 to 20 per cent lower for trickle operations; and a similar reduction in operating cost is obtained.

Hydrogen sulfide recycle . . . Typical results given in Table I show that the reduction in sulfur removal, which resulted from leaving the hydrogen sulfide in the recycle gas, is very small; further, no permanent loss of catalyst activity could be detected in pilot-plant runs of long duration during those periods when hydrogen sulfide was present in the recycle gas.

The removal of hydrogen sulfide from the recycle gas can, therefore, be omitted in this trickle process—the hydrogen sulfide produced leaving the system with the liquid product from which it is removed by flashing. This

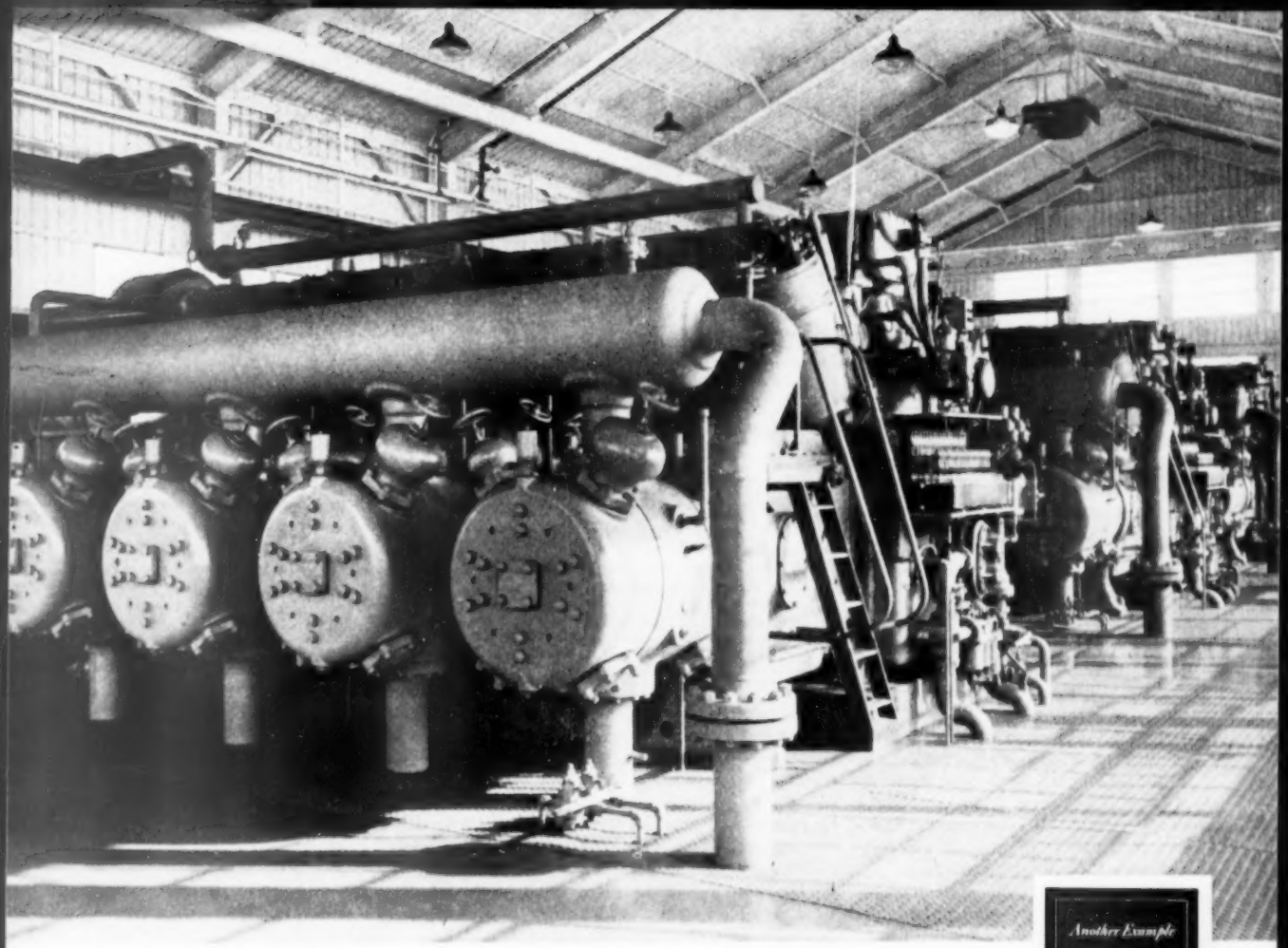

PER CENT SULFUR REMOVAL
100
90
80
70
60
50
TRICKLE
VAPOR PHASE
LIQUID HOURLY SPACE VELOCITY (VOL. OIL / VOL. CAT. HR.) = 2.4
LIQUID HOURLY SPACE VELOCITY = 3.6
10^2 2 3 4 6 8 10^3 2 3 4 6 8 10^4 2 3 4 6 8 10^5
HYDROGEN RECYCLE RATE SCF/BBL. OIL

Effect of hydrogen recycle rate on sulfur removal in the trickle hydrodesulfurization process. Fig. 1.

TABLE I—EFFECT OF HYDROGEN SULFIDE IN RECYCLE GAS

(Feed stock: Middle East light catalytically cracked cycle oil)

A.S.T.M. boiling range, °F.	460 to 640			
Gravity, °A.P.I.	21			
Sulfur, per cent by weight	3.1			
Plant—				
Reactor, in.	3			
Catalyst-bed height, ft.	18			
Processing conditions—				
Pressure, psia.	750			
Temperature, °F.	708			
Liquid hourly space velocity, vol. per vol. per hour	2.2	2.2	1.1	1.1
Recycle-gas rate, s.c.f. per bbl.	270	270	1,350	1,350
Hydrogen-sulfide removal from recycle gas	Yes	No	Yes	No
Sulfur removal, per cent	86	86	95	94



Line up of three 1100 hp Cooper-Bessemer GMV's at Equitable Gas Company's D. P. Hartson station, built by the Fluor Corp. A similar station, Pratt, designed by Stone and Webster and built by Equitable, has four GMV-8's rated 880 hp each.

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3-Way Economy for Equitable Gas

. . . with this modern GMV line-up

EQUITABLE GAS COMPANY'S D. P. Hartson Station, south of Pittsburgh, pumps 25 million cubic feet of gas daily from transmission lines into underground storage. It is typical of stations everywhere enjoying multiple savings with modern Cooper-Bessemer V-angle compressors.

Fuel economy . . . Today, Cooper-Bessemer V-angle engines offer the highest thermal efficiencies ever reached. With fuel consumption guaranteed as low as 8500 B.T.U./bhp/hr, it's the same as buying your gas at lower rates!

Space economy . . . To the inherent compactness of V-engine, V-angle design, add the fact that every crankthrow is available for driving a compressor cylinder. This, along with greatly increased horsepower output, means unmatched compressor capacity for your investment in space, foundation, piping and building.

Over-all operating economy . . . Higher thermal efficiency, with less fuel consumed, just naturally means less down-time, less maintenance, fewer replacements and reduced supervision per horsepower output.

You can make the most of modern advancements by checking your compressor needs with the nearest Cooper-Bessemer office.

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again leads to a significant saving in capital and operating costs, particularly in refineries where no removal of hydrogen sulfide from the tail gas is necessary, or where the relatively small quantity of tail gas can be routed to an existing plant for hydrogen-sulfide removal.

Operating conditions . . . The process can be operated at pressures ranging from 300 to 750 psia., and at temperatures from 660° to 730° F. The preferred conditions for deep desulfurization (80 to 90 per cent sulfur removal) from middle distillates are at pressures from 600 to 750 psia. and at temperatures from 690° to 720° F.

In pilot-plant runs of long duration, during which a number of straightrun stocks were processed under these conditions, with recycle-gas rates of 300 to 1,250 s.c.f. per barrel no significant decrease in catalyst activity could be observed after up to 20,000 volumes of oil had passed over 1 volume of catalyst—without any intermediate regeneration. Coke deposition is practically nil, corresponding to less than 0.0005 per cent by weight of oil charged.

With catalytically cracked cycle stocks, the decrease in catalyst activity experienced was still very small, if any, after some 4,000 volumes of oil had passed over 1 volume of catalyst.

When a heavy Middle East flashed distillate was fed to the pilot plant, catalyst activity was not reduced during a 400-hour operation. Furthermore, apart from desulfurization, an additional refining effect—consisting in a marked reduction of Conradson carbon—was observed.

Under the conditions of the trickle-hydrodesulfurization process, sulfur and oxygen proved to be largely removed from Colorado shale oil; this was true also, although to a smaller extent, with respect to resinous materials. Nitrogen, however, was only partly hydrogenated. By increasing the pressure to 2,150 psia., this deficiency could be remedied—all contaminants then being removed to the extent of 70 to 90 per cent.

Diluents in makeup hydrogen . . . The decrease in degree of desulfurization was found to be small when a buildup of 15 per cent by volume of methane was permitted in the recycle gas. The percentage of methane which can be tolerated in the makeup hydrogen is, of course, a function of the amount of hydrogen consumed in the hydrodesulfurizan reaction.

When stocks with a sulfur content of, say, 1 to 1.5 per cent by weight are desulfurized, makeup hydrogen with a methane content of 7 to 10 per cent by volume can be used without any provisions for hydrogen concentration. If makeup hydrogen with such concentrations of methane must be used for desulfurization of higher sulfur-content stocks, the buildup of methane and other diluents in the recycle gas preferably should be depressed either with a simple concurrent oil wash or by application of a small bleed from the recycle gas.

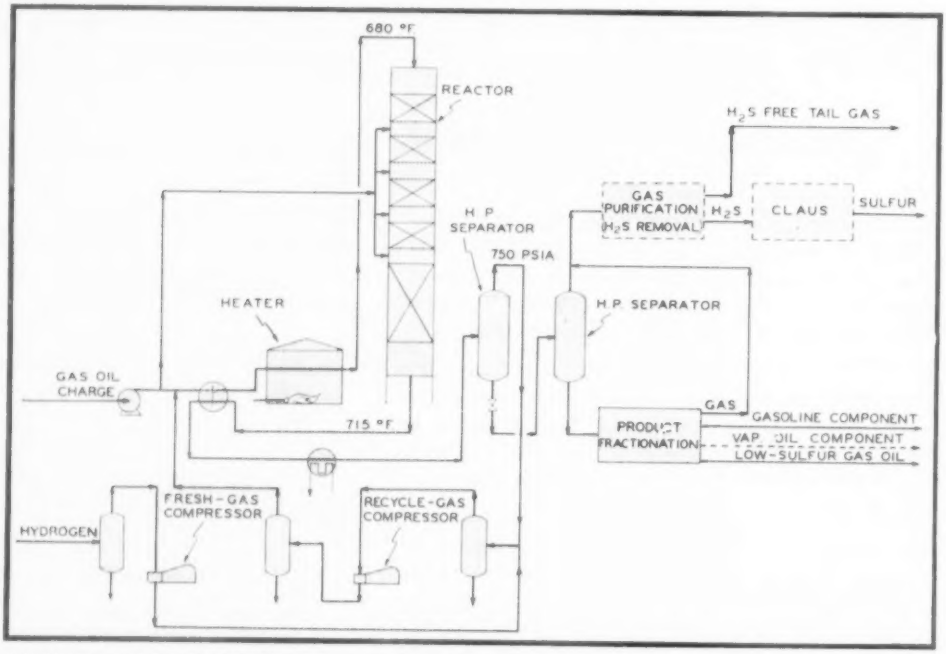
Hydrogen consumption . . . From a large collection of data, it can be calculated that the hydrogen consumption in trickle hydrodesulfurization of

TABLE 2—TRICKLE HYDRODESULFURIZATION OF MIDDLE EAST LIGHT CATALYTICALLY CRACKED CYCLE OIL (PRODUCT PROPERTIES)

Processing conditions	
Catalyst	Cobalt-molybdenum-alumina
Pressure, psia.	750
Temperature, °F.	710
Liquid hourly space velocity, volumes per volume per hour	1.6
Recycle-gas rate, s.c.f. per bbl.	1,350

		Products			
	Feed stock	Fraction,* Under 430° F.	Fraction,* 430° to 500° F.	Fraction,* 430° F. plus	Fraction,* 500° F. plus
Per cent by weight of feed	100	9.9	20.3	87.6	67.3
Per cent by volume of feed	100	10.7	21.3	90.4	69.1
Gravity, °A.P.I.	21.3	33.8	25.4	26.1	25.5
A.S.T.M. distillation (°F.):					
I.b.p.	446	270	437	475	532
E.p.	650	417	470	650	650
Sulfur, per cent by weight	2.90	0.01	0.02	0.34	0.43
Extractable with 98 per cent sulfuric acid, per cent by weight	70	87	80		
Octane numbers:					
A.S.T.M., without TEL addition		90	70		
C.F.R. research, without TEL addition		100+	88		
Pour point, °F.	14			19	25
Diesel index	19.5			27.1	29.9

*Sharp fractionation.



SIMPLIFIED FLOW DIAGRAM of a commercial-scale unit for trickle hydrodesulfurization of middle distillates. Fig. 2.

TABLE 3—COST OF HYDRODESULFURIZATION
(Major contractor's estimate, Gulf Coast, U.S.A.)

Charge stock—	Middle East straightrun gas oil	Middle East light catalytically cracked cycle oil
A.S.T.M. distillation, °F.:		
I.b.p.	496	446
E.p.	666	650
Sulfur content, per cent by weight	1.3	2.9
Sulfur removal, per cent	85	85
Plant capacity, bbl. per stream day	10,000	10,000
Plant investment (inside plot; including first catalyst charge, excluding process and engineering design), dollars	930,000	1,300,000
Operating cost (excluding depreciation and interest), cents per barrel of intake:		
Hydrogen[1]	0.5	1.3
Catalyst	1.9	3.5
Utilities[2]	1.7	2.5
Operating labor[3]	2.4	2.4
Maintenance[3]	1.1	1.6
Supervision and refinery overhead[3]	3.8	4.2
Taxes and insurance[4]	0.5	0.8
	11.9	16.3
Product:		
Low-sulfur diesel-fuel component, gallons per barrels of intake	41	38
Byproducts:		
Heavy-gasoline component, gallons per barrel of intake		4.5
Hydrogen sulfide, s.c.f. per barrel of intake	40	95

1. At fuel equivalent of 10 cents per million B.t.u.'s.
2. Four per cent of capital per year.
3. Eighty per cent of operating labor plus maintenance.
4. Two per cent of capital per year.

straightrun middle distillates (boiling range, 440° to 660° F.), over a cobalt-molybdenum-alumina catalyst, amounts, on an average, to 50 s.c.f. per pound of sulfur removed—which is equivalent to approximately 4 mols of hydrogen per atom of sulfur removed. Furthermore, a slightly higher figure was found for Middle East catalytically cracked cycle oils.

This is close to the theoretical minimum of 3 mols per atom of sulfur removed which may be expected for hydrogenation of the sulfur compounds (alkylbenzothiophanes) which predominate in Middle East straightrun and catalytically cracked cycle oils. This fact confirms that the cobalt-molybdenum-alumina catalyst used possesses a satisfactory degree of selectivity under the conditions applied. Hydrogenation of aromatics is almost completely suppressed, but hydrogenation of olefins cannot be avoided entirely.

It may be of interest to note here that, for the majority of crudes, the quantity of hydrogen produced in catalytic reforming of the naphtha cut is more than sufficient to meet the hydrogen requirements in the hydrodesulfurization of light catalytically cracked cycle oil. This hydrogen balance can even be achieved in the case of the low-naphthenic high-sulfur Middle East crudes.

Product Yields and Properties

The liquid-product yields obtained are extremely high; i.e., no formation of light ends, apart from that which resulted from breakdown of sulfur compounds, could be observed. The hydrogenation of sulfur compounds results in part, in the formation of hydrocarbons boiling in the gasoline range, and the latter usually have to be removed from the desulfurized product because of their flash point.

"For the majority of crudes, the quantity of hydrogen produced in catalytic reforming of the naphtha cut is more than sufficient to meet the hydrogen requirements in the hydrodesulfurization of light catalytically cracked cycle oil."

In the case of hydrodesulfurization of catalytically cracked cycle stocks, these gasoline components result from hydrogenation of alkylbenzothiphenes, and they are, therefore, of high aromatic content and octane rating. This is illustrated in Table 2, which also contains some data on the properties of various cuts prepared from the desulfurized product.

The 430-500° F. fraction forms an excellent component for the manufacture of engine-fuel-type kerosine which, on blending with straightrun naphtha, satisfies all specifications. The 430° + F. or 500° + F. fractions are suitable for blending with straightrun gas-oil fractions into a low-sulfur high-speed diesel fuel.

It should be noted that the trends just indicated are not limited to Middle East catalytically cracked cycle oils; additional experiments with cycle oils from U. S. commercial catalytic cracking operations gave similar results—the amount of aromatic gasoline formed being roughly proportional to the sulfur content of the front end of the cycle oil.

Commercial Application

The trickle hydrodesulfurization process described herein is suitable for the desulfurization of a large variety of stocks. It should be noted that, inasmuch as no vaporization of the oil feed is necessary, high-boiling distillates, which would require excessive recycle-gas quantities for vaporization under the process conditions, can be desulfurized without difficulty.

Fig. 2 is a simplified flow diagram of a commercial-scale unit for a trickle hydrodesulfurization of middle distillates. Such a unit is now under construction at the Stanlow (England) Shell Refining & Marketing Co., Ltd. Oil charge and fresh hydrogen, as well as recycle hydrogen, are combined. The combination is first preheated by exchange with hot reaction products, and then is heated in a small gas or oil-fired furnace.

The reactor may contain a number of catalyst beds, between which cold charge oil is injected to take up the heat produced in the exothermic hydrogenation reaction. The number of beds required depends upon the sulfur content of the charge stock and upon the degree of sulfur removal desired. With low-sulfur stocks, i.e., stocks with a sulfur content of, say, approximately 1 per cent by weight or less, intermediate cooling may be omitted.

The reaction products, after heat exchange with the feed, are cooled further and then passed to the high-pressure separator—from which, after the addition of makeup hydrogen, the gas is recycled. The liquid from the high-pressure separator is flashed in a low-pressure separator, and is then passed to a product fractionating section for removal of the remaining hydrogen sulfide and light ends.

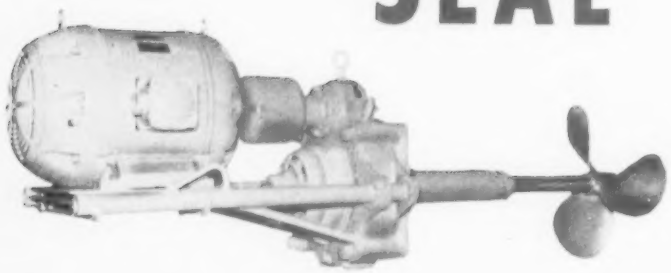
If desired, and engine-fuel type of kerosine component may be recovered. The low-pressure tail gas is, if desired, passed to a gas-purification plant for removal of hydrogen sulfide; and the later may, for example, subsequently be converted to sulfur in a Claus plant.

For most commercial applications the rate of decrease of catalyst activity will be extremely low, corresponding to

NOW . . . *for even greater economy,*

The SJR SHORTSTIR Mixer IS AVAILABLE WITH . . .

A NEW MECHANICAL SEAL



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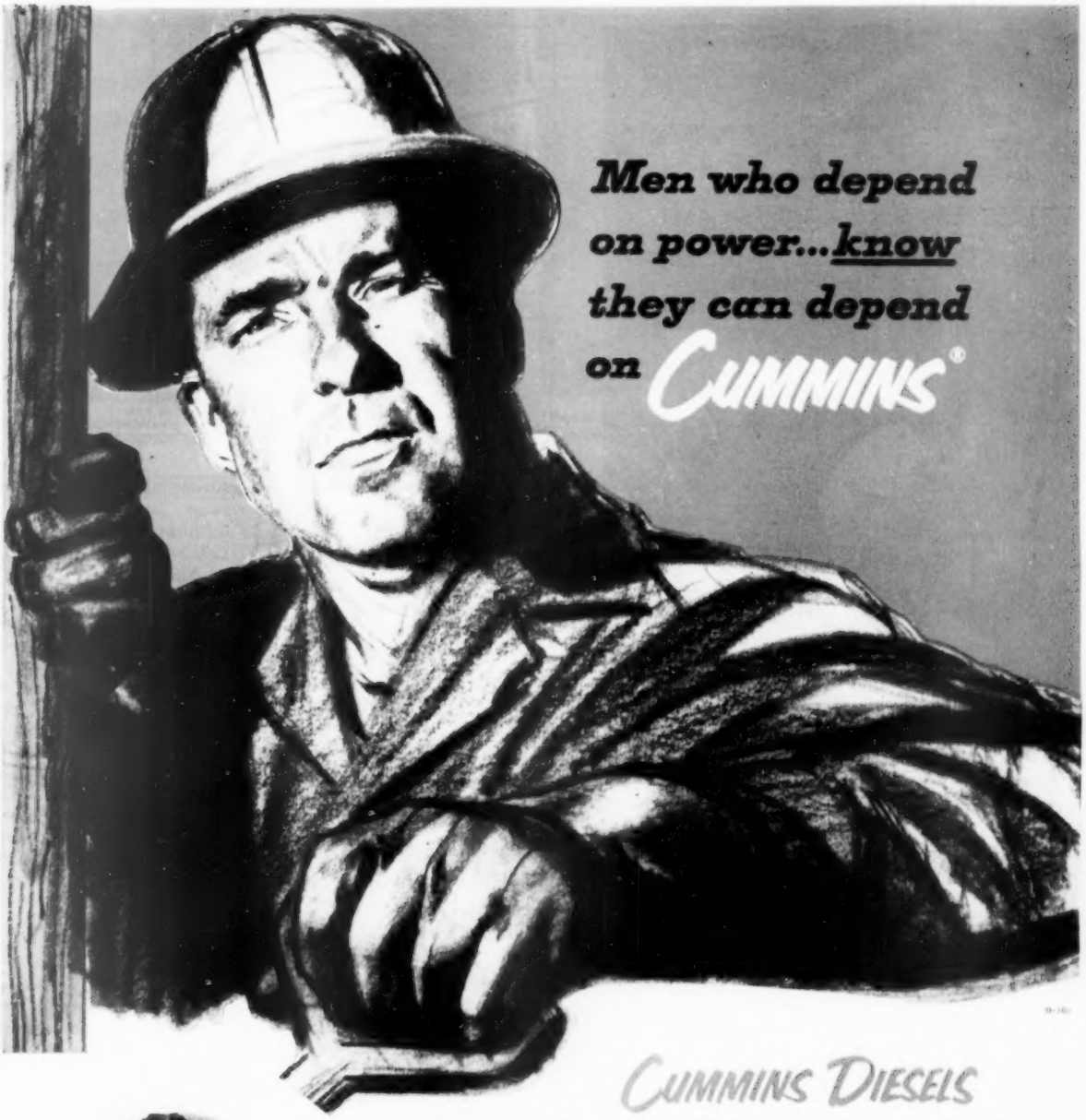

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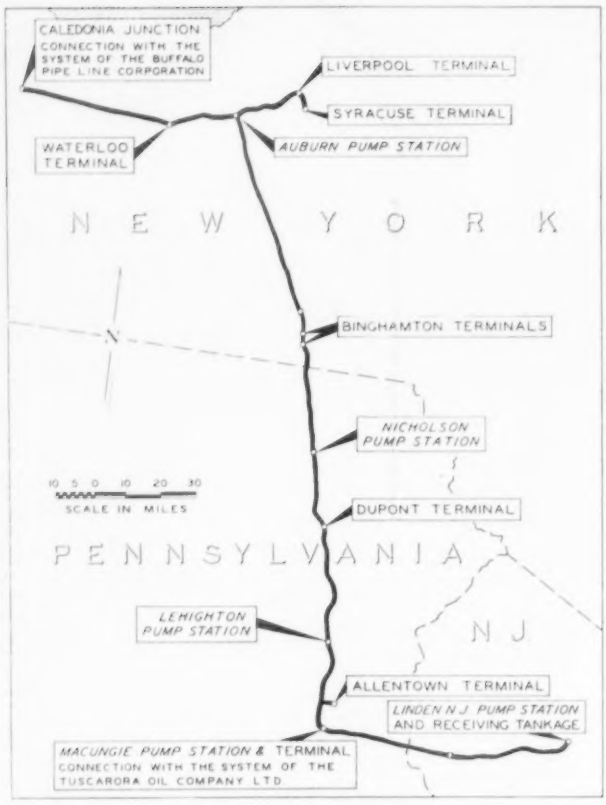
Road-boring machine at crossing near Macungie station.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Route of Buckeye's northeastern products pipe-line system.

Buckeye Builds Northeast Products Line

by A. J. Helmbrecht

AS Linden station was turned on the line in early June 1953, operation commenced over the first leg of Buckeye Pipe Line Co.'s eastern products pipe-line system. Nearly 2 years of preliminary work preceded the construction, during the summer of 1952, of this initial section from Linden, N. J. to Allentown, Pa.

This system, 356 miles in length, provides pipe-line transportation for petroleum products from the refineries and deep-water terminals in the Linden-Bayway area, and through its connection with the proposed Harbor Pipe Line, from the Philadelphia area, to Pennsylvania and central New York State delivery points. Rochester and Buffalo, are served through its connection to Buffalo Pipe Line Corp., south of Rochester.

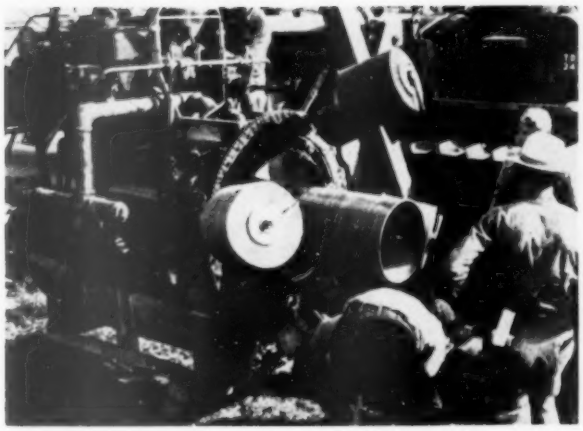
Line route . . . Buckeye's 16-in. line starts at Linden, where products are received from nearby refineries, deep-water bulk plants and runs west to Allentown, where a transfer of products is made to the lines of Tuscarora Pipe Line Co., Ltd., for movement to central and western Pennsylvania points.

From Allentown a 14-in. line will run north through Scranton, Pa., and Binghamton, N. Y., to a point near Auburn, N. Y. Here the line will branch in two directions with a 10-in. line running east to Syracuse, N. Y., and a 10-in. line running west to Caledonia, N. Y. At Caledonia, Buckeye's line will connect with existing lines of Buffalo Pipe Line Corp., permitting deliveries to Rochester and Buffalo. The construction of the line north of Allentown began in April 1953 and it is planned that operations of the entire system will start in the fall of 1953.

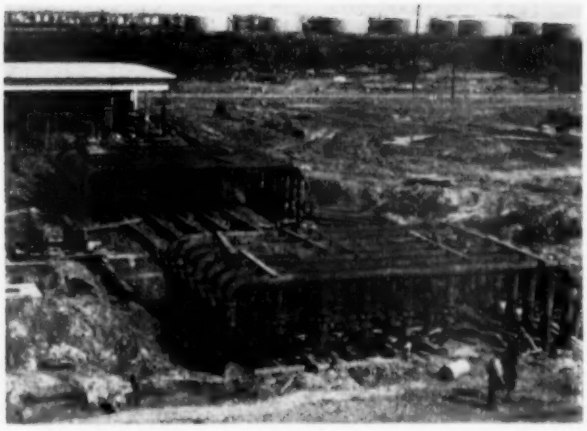
Pump stations . . . The construction of Buckeye's pump station at Linden is completed and at Macungie, Pa., (near Allentown) the station is well under way. Other pump stations will be located at or near Lehighton and Nicholson, Pa., and Auburn, N. Y. Construction on these stations will be started soon. Shippers' delivery terminals will be located in the vicinity of Allentown, Scranton, Binghamton, Liverpool, Syracuse, Waterloo; and at Rochester and Buffalo, on the Buffalo Pipe Line.

It is estimated that initially the line will have a tendered volume of approximately 87,000 bbl. per day of all products consisting of three grades of gasoline, kerosine, diesel fuel, and heating oil. With the exception of kerosine, all products will be handled as segregated stocks. The small volume of kerosine offered makes it necessary to handle it as a common stock product.

Company operation . . . Buckeye Pipe Line Co. is an independently owned and operated common-carrier pipe line and with its Midwest Products Division operates a 355-mile products system in the states of Illinois, Indiana, and Ohio, serving Indianapolis, Mun-



Starting the operation of coating and wrapping machine on 16-in. line east of the Delaware River.



Pump-station manifolds with overhead piping being constructed at Linden, N. J.

cie, Lima, and Toledo. Its principal volume of business, however, is the transportation of crude oil to the refinery areas of East Chicago, Detroit, Toledo, Cleveland, and Buffalo.

The following shippers are expected to use Buckeye's eastern products pipe line for their product distribution: American Oil Co., California Oil Co., Cities Service Oil Co., Crown Central Petroleum Co., Esso Standard Oil Co., Gulf Oil Corp., G. L. F. Farm Supplies, Hartol Petroleum Corp., Sinclair Refining Co., Shell Oil Co., The Texas Co., and Tide Water Associated Oil Co.

The location of some delivery points was dictated by shippers' existing terminal facilities, now served by other transportation. In those areas where no terminal facilities were in existence, primary consideration in the selection of terminal sites was given to central location with respect to consumer distribution. At the terminals, products will be metered into shippers' tank lines at a centrally located pipe-line manifold. The general design for construction and operation of Buckeye's line will follow established practices for products pipe lines but an attempt has been made to incorporate into the design, successful features of a number of other pipe lines.

The entire line, consisting of 74 miles of 16-in. Linden to Macungie, 186 miles of 14-in. Macungie to Auburn, 27 miles of 10-in. Auburn to Syracuse, and 69 miles of 10-in. Auburn to Caledonia, will be constructed of A. P. I. 5LX-46 pipe, principally seamless, for a working pressure of 900 psi. When handling gasoline the 16-in. will have an initial capacity of 115,000 bbl. per day Linden to Macungie.

The erection of a booster station in the future will increase this to 183,000 bbl. per day. The 14-in. line Macungie to Auburn will have an initial capacity of 78,000 bbl. per day going to 118,000 bbl. per day with the installation of a booster station in the future. Between Auburn and Caledonia the initial capacity will be 47,000 bbl. per day present and 69,000 future.

Station design . . . The initial pump station located at Linden, where all products will be received into the system, will be of conventional design using explosionproof electric motors and series-connected centrifugal pumps sized so as to permit future expansion by adding pumping units and changing impellers. This station will have a substantial tank farm consisting of gas-tight cone-roof tanks for distillates and floating-roof tanks for gasoline. All tankage will be equipped with sump bottoms and booster pumps sized to permit pumping each tank dry at full pipe-line rate to facilitate swinging tankage from one segregated product to another.

For the sake of uniformity, replaceability, and ease of maintenance, all tank boosters are identical and the tank lines have been sized to provide constant pressure drop between tanks and suction manifold regardless of length of suction line. Furthermore, in order to keep the tank booster pump motor size to 50 hp., the tank booster pump provides only the head necessary to move the product through the suction manifold at which point a suction booster provides the additional pressure necessary to move the product through the strainers and meter manifold and provide suction head for the main-line pumps. The pump station at Macungie will be similar to the one at Linden.

Products received into Buckeye's system at Linden will generally be received into tanks and measured by tank gaging, and all deliveries into shippers' terminals will be made by meters. Hay tanks and felt-type strainers will be installed for the protection of meters and the line will be protected by the use of an inhibitor—although selection of an inhibitor has not been made at this time. The entire line, except for relatively short stretches protected by Somastic, will be coated with a glass-reinforced coal-tar enamel and an outer wrap of saturated asbestos felt. Communication for the line will be by means of teletype.

Expansion emphasis . . . This substantial addition to Buckeye's existing system has been designed with special emphasis on provision for orderly, efficient future expansion. Almost without exception, the traffic requirements for products lines have exceeded their design capacity within a very few years and have had to resort to uneconomically close station spacing, or the laying of parallel lines in order to accommodate the traffic. Buckeye's system is designed to handle well in excess of double its initial anticipated volume without resorting to either of these expedients.

The design and engineering of Buckeye's lines are the work of Pipe Line Engineering Co., of Dallas, headed by F. F. Warterfield, Jr., who has been retained as a consultant, working in cooperation with the company's engineering and operating personnel.

THE AUTHOR

A. J. Helmbrecht, assistant to the president of Buckeye Pipe Line Co., graduated from Stevens Institute of Technology in 1935. After short service with General Electric Co. and Western Electric Instrument Corp. he joined Buckeye later in the year as assistant chief engineer. In 1948 he was promoted to chief engineer and in 1952 to his present position.

Fig. 1—Internal surface of severely blistered accumulator.

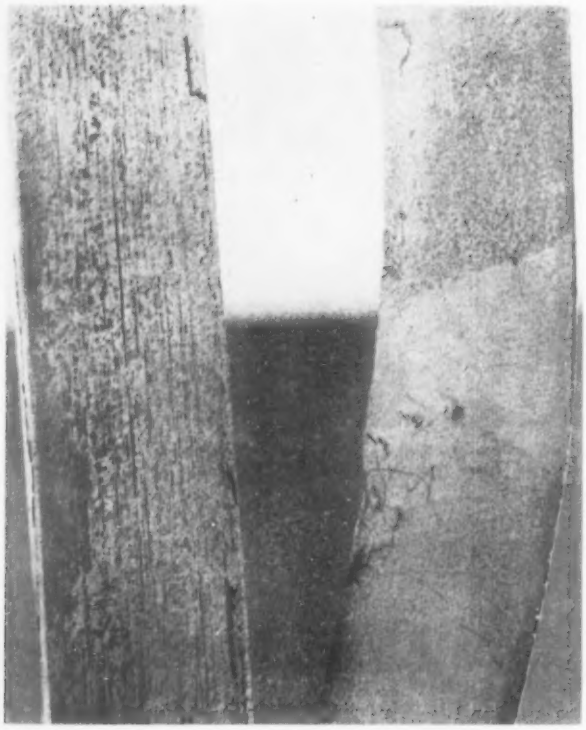


Fig. 2—Laminations and fissures resulting from hydrogen attack on condenser shell.

Industry probes means of combating

HYDROGEN ATTACK ON STEEL

in refinery equipment

Sulfur, added as ammonium polysulfide, at the rate of 0.23 lb. per day to a 1,000-bbl. per day light-hydrocarbon stream, high in H_2S and with water content at between 1 to 5 gal. per day was effective in preventing hydrogen attack. In other experiments 3.5 cu. ft. of oxygen per day, in place of polysulfide, also proved effective.

by

W. A. Bonner,* H. D. Burnham,*

J. J. Conradi,* and T. Skei†

IN accordance with industry-wide interest and cooperation on the problem of hydrogen attack on steel, Shell Oil Co. is making available its experience at the Wood River refinery with this type of attack, which results in blistering and fissuring of refinery equipment.

This report is of prime interest with regard to (1) plant experience with polysulfide and oxygen injection, and (2) permanent plant installation for control of hydrogen penetration.

*Shell Oil Co., Wood River, Ill., and †Shell Development Co., Emeryville, Calif. Portion of paper presented at A.P.I. division of refining meeting, New York, May 1953.

Additional information is presented on methods of detecting hydrogen penetration, conditions necessary for attack to occur, possible methods for controlling hydrogen penetration, and effect of polysulfide.

Hydrogen attack on steel has caused extensive damage in a number of refineries.[2,3,4,7,9,12,13]

Hydrogen attack, as discussed here, is limited to that associated with aqueous corrosion in which the hydrogen penetrating the steel is a product of a corrosion reaction.

Blistering . . . Fig. 1 is a typical example of a blistered area in an accumulator 6 ft. in diameter, fabricated from A.S.T.M. A 70 firebox-quality steel. This vessel had been in service approximately 5 years prior to removal because of severe blistering. Blisters ranged in size up to 3 in. in diameter and 28/64 in. deep in 1-in. plate.

Fissuring . . . In Fig. 2 are shown two sections cut from a condenser shell which was fabricated from A.S.T.M. A 70 firebox-quality 5/8-in. steel. This photograph shows typical laminations and fissures extending to a depth of 9/64 in. The condenser had also been in service approximately 5 years prior

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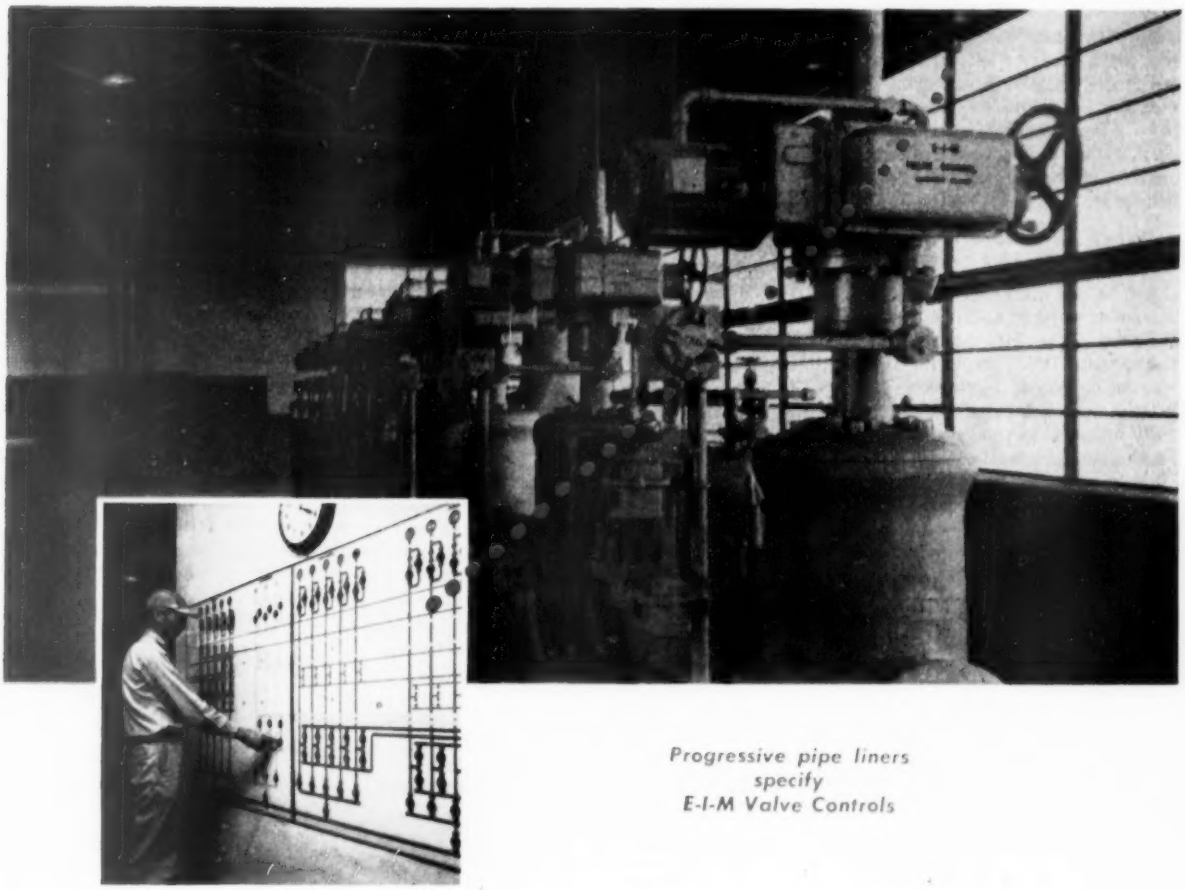

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to its removal because of hydrogen damage.

No visible change . . . Bend-test specimens shown in Fig. 3 were cut from the same vessel from which the specimens in Fig. 2 were taken. The type of failure shown in Fig. 3 merits particular attention because it demonstrates that, even in areas where no visible change has occurred, permanent damage to the steel may exist.

Fig. 3 shows test specimens cut from an area visibly free of blisters and fissures. Bend tests were performed approximately 3 months after the vessel had been removed from service. This should be ample time for essentially all the atomic hydrogen to diffuse from the steel, but molecular hydrogen trapped in microscopic voids may still have been present. The specimen in the upper part of Fig. 3—bent in such a direction that the process side was placed under tensile stress—is seen to exhibit a brittle fracture, this failure occurring at 16°. However, the lower specimen, bent in the opposite direction such that compression stress was placed on the process side, shows a normal behavior in the bend test.

Fig. 3—Bend-test specimens showing permanent hydrogen damage.

Plant Experience—Polysulfide and and Oxygen Injection

Up to the time polysulfide was observed to prevent hydrogen penetration completely, the only method which was partly successful for plant protection was water wash for the removal of cyanides. Washing facilities were originally installed to reduce the occurrence of plugging deposits, chiefly carbonates and complex cyanides in gas-plant equipment. When it was sought to remove cyanide by water, washing rates were increased approximately 20-fold to 200 g.p.m., which effected a 60 per cent reduction in cyanide concentration in the process stream. This copious water wash achieved a substantial decrease in the frequency and severity of blistering, but did not afford complete protection to the gas-recovery plants.

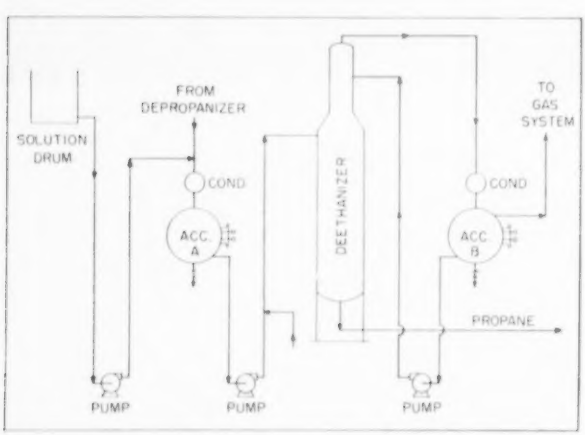
When the ability of polysulfide to prevent hydrogen penetration had been clearly demonstrated in laboratory experiments, plant-scale experiments with polysulfide and oxygen injection were undertaken.

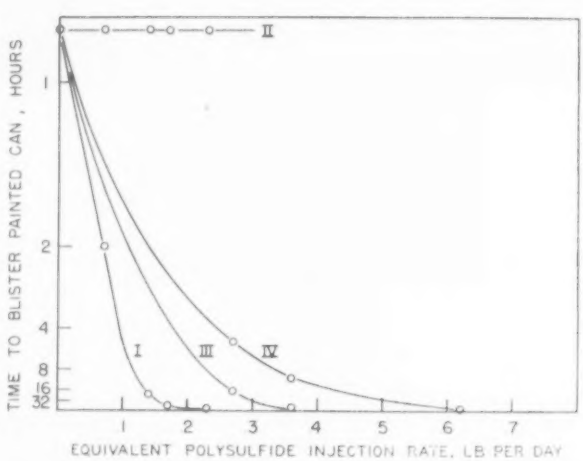
Depropanizer accumulator . . . The first plant facilities for evaluating the effect of polysulfide were installed ahead of a vessel where the water accumulation (normally 1 to 5 gal. per day) consistently blistered painted cans. Prior inspections had disclosed a continual increase in the number of blisters in this unit. The facilities consisted of a makeup drum for polysulfide solution and an injection pump of adjustable rate (Fig. 4). Polysulfide solution was injected into the vapor line ahead of the condensers, and was carried into the accumulator by the hydrocarbon stream, normally 1,000 bbl. per day. Injection of polysulfide at various rates continued for 2 weeks, during which time encouraging data were obtained.

Prior to injection of polysulfide into the overhead vapor line, samples of water withdrawn from accumulator A (Fig. 4) blistered a painted steel test can in ½ to 1 hour. When polysulfide was injected at a rate of 0.07 lb. of free sulfur per day, the time required for blistering a painted test can was increased to 2 hours. Increasing the polysulfide rate further increased the time required to blister the can. When the polysulfide rate was 0.23 lb. of sulfur per day, the water withdrawn from the accumulator failed to blister the can in 12 days. Two days after the injection of polysulfide had been terminated, the time required for the water samples from accumulator A to blister painted test cans returned to its original value of ½ to 1 hour.

During the tests additional ammonium sulfide solution was injected along with the polysulfide to maintain the pH essentially constant. This was necessary to prevent decomposition of polysulfide and consequent contamination of the hydrocarbon stream with free sulfur.

As might be expected when a low-vapor-pressure liquid or dissolved in-





PLANT TESTS were conducted on the effectiveness of polysulfide and oxygen injection on combating hydrogen attack. At left (Fig. 4) is flow diagram of plant test equipment. Curves at right (Fig. 5) show results of comparative effectiveness tests. Painted-can technique was used for measuring hydrogen-penetration tendency of accumulator waters. I—Accumulator A during polysulfide injection. II—Accumulator B during polysulfide injection. III—Accumulator A during oxygen injection. IV—Accumulator B during oxygen injection. Equivalent injection rate refers to pounds of free sulfur per day.

hibitor is injected into a solution and, hence, does not come in contact with all regions of the vessel, the effectiveness of this liquid or inhibitor can be realized only on those portions of the system with which it comes in contact. It is not surprising, therefore, that some probe activity was found in accumulator A during the polysulfide-injection tests. Similarly, injection of polysulfide solution had no beneficial effect on the corrosiveness of the water from accumulator B (Fig. 4). Accumulator B normally handles 350 bbl. per day of hydrocarbon, and 2 to 10 gal. of water per day is removed at this point.

Effect of oxygen . . . Facilities were installed for injecting oxygenated water into the same plant equipment as had been used for the polysulfide-injection test (Fig. 4). Ammonia solution was injected along with the oxygenated water in order to control the pH of the accumulator water to essentially a constant value during the test.

The addition of oxygenated water at a rate which represented an oxygen injection of 2 cu. ft. per day was successful in preventing the blistering of painted test cans filled with water from the deethanizer accumulator (accumulator B). When the oxygen-injection rate was increased to 3.5 cu. ft. per day into accumulator A, the paint on the test cans which contained water samples from both accumulators A and B did not blister in a period of 7 days. No hydrogen-probe activity was detected during the time when oxygen was injected into the plant. Whenever oxygen injection was discontinued the time required for the water samples to blister painted test cans returned to the original value of ½ to 1 hour.

The injection of water which contained ammonia but which did not contain oxygen increased the time required for blistering of painted test cans to 1½ hours—which proves that the protection of steel obtained by oxygen injection is not due merely to the dilution effect of the water.

The deactivation of water in accumulator B indicates that oxygen can diffuse throughout the system and react with hydrogen sulfide to form polysulfide in situ and protect the unit.

All the data on the effectiveness of polysulfide and oxygen in reducing hydrogen penetration, as determined by the painted-can method, are presented graphically in Fig. 5. It is seen that polysulfide is more effective than an equivalent amount of oxygen—probably because of the slowness of the reaction between oxygen and hydrogen sulfide. On the other hand, when a sufficient concentration of oxygen had been used, protection was obtained through the second unit following injection. Therefore, the use of oxygen rather than polysulfide appears very attractive for the practical control of hydrogen penetration.

Permanent Plant Installation

Pure oxygen was used in the plant experiments for the control of hydrogen attack. Laboratory results have shown the air injection is equally effective on the basis of oxygen added to the system. It is planned that the permanent plant installation will consist of small air compressors which operate continuously and which discharge directly into the processing stream. Design capacity of the compressors is such that amount of air injected will be limited consistent with safety considerations. Furthermore, operation of the compressors is to be contingent upon the maintenance of at least 40 per cent normal flow of the hydrocarbon stream. For flow rates below 40 per cent of normal, the compressors will be inoperative.

Catalytically cracked streams . . . The arbitrary figure for air injection in such streams has been set initially at five times the amount required for conversion of all cyanide to thiocyanate. This amounts to approximately 10 cu. ft. of air per minute for 20,000,000 cu. ft. of hydrocarbon gas per day. The thermally cracked gas streams contain considerably less cyanide than the catalytically cracked gas stream, but it is planned to maintain the same air-to-hydrocarbon gas ration in both systems. It is likely that this ratio will be subject to change as operating experience is accumulated.

Except for the maintenance of a slight excess of oxygen to take care of possible variations in the quantity of cyanide produced, there is no advantage in adding more oxygen than required to bring hydrogen penetration under control. Obviously, large excesses of air should be avoided to minimize undesirable reactions which may occur between oxygen and hydrocarbons. Furthermore, on the basis of laboratory data, it is believed that once hydrogen penetration is stopped, less polysulfide will be required to maintain control than is necessary to achieve control.

It should be reemphasized that the use of oxygen or polysulfide for control of hydrogen penetration is only effective in alkaline solution; and, in order to minimize undesirable reactions, pH should be maintained above 7.8 by ammonia injection.

Detecting Hydrogen Penetration

Frequent internal and external inspection of all equipment subject to environments conducive to hydrogen attack is necessary because other detection methods fail at one time or another.

Direct inspection . . . External inspections of lines, especially lap-welded pipe, have located new blisters during operation. In other cases vessels have blistered externally, but by far the most extensive blistering in refinery equipment occurs internally. Inasmuch as frequent shutdowns for inspection are quite costly, several methods have been used to predict the occurrence of internal blistering.

Hydrogen probes . . . These have been used extensively throughout the plant. The standard probe is fitted with a pressure gage so that readings are actually taken in pounds per square inch. The penetration rates given in this article are expressed in cubic centimeters of hydrogen (measured at a temperature of 60° F. and at a pressure of 14.7 psi.) collected per square inch of active probe surface per day. Therefore, the rates have been corrected for variations in the internal volume, for the area of the active surface of the probe, and for variations in ambient temperature at the time of the reading.

Probes have not consistently indicated blistering conditions as evidenced by subsequent inspections. Location of the probes in the equipment appears to be critical.

Measuring penetration . . . Steel pads fitted with pressure gages for recording the amount of hydrogen penetrating the vessel wall have been welded on equipment suspected of being under hydrogen attack. In general, pads are much more difficult to install, and are not so sensitive; therefore, they are not so useful as probes.

Paint as an indicator . . . One of the quickest and most sensitive methods of detecting an active system is to notice if the paint is blistered. However, the painted can has become a very useful laboratory device for testing water accumulations from refinery equipment.

Conditions Necessary for Attack

The following six factors usually occur simultaneously whenever blistering has been observed:

1. A steel surface subject to corrosion.
2. A source of reactive hydrogen.
3. A liquid-water phase.
4. An agent capable of poisoning steel surface so that the formation of molecular hydrogen from atomic hydrogen is retarded.
5. Gross imperfections in the steel, such as a slag inclusion, a void, a discontinuity, or minute imperfections such as rifts within single crystals.
6. A promoter which maintains an active steel surface.

(Continued on page 130)

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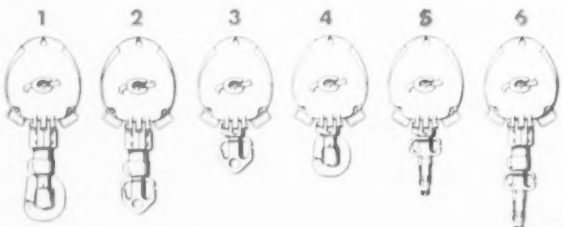

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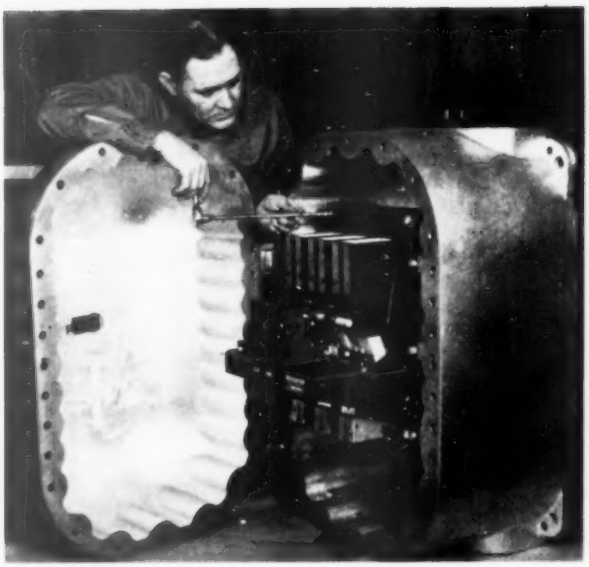

Low-voltage air circuit breakers are available in explosionproof housings. Fig. 1.

Metal-clad breaker maintenance is facilitated by use of the test rack. Fig. 3.

SWITCHGEAR MAINTENANCE

. . . in petroleum refineries

H. B. Wortman*

Metal-clad switchgear features are available in designs modified to provide oil-bath seals against corrosive atmospheres. Fig. 2.

RELIABLE service in refinery switchgear is dependent upon the proper selection of equipment and adequate maintenance. Whenever possible, it is advisable to make installations in nonhazardous areas, to take advantage of lower costs and better operating conditions.

Fundamental maintenance requirements include cleanliness, moisture control, the replacement or repair of worn parts, and the reprocessing of insulating oil. A precise schedule will depend on local conditions and on the severity of operating duty.

Nonhazardous locations . . . If switchgear can be placed in nonhazardous locations, the designs developed for the usual applications should be used. This switchgear will be obtained at a relatively low initial cost because of mass-production economies. In addition, maintenance programs are simpler and less expensive.

Another advantage of nonhazardous

* Supervising engineer, outdoor metal-clad switchgear section, Western Electric Corp., East Pittsburgh, Pa. Presented at midyear meeting, A.P.I. Division of Refining, New York, May 12, 1953.

locations will be apparent during these maintenance periods. At these times, when contacts and terminals may be exposed, the dangers of explosion can be greatest. This may require scheduling to suit relatively safe periods and, even then, must be associated with some element of risk.

For mildly corrosive atmosphere it has been found desirable to enclose control panels and breaker-closing rectifier units under covers which will restrict the passage of air and limit the introduction of corrosives to metallic surfaces.

Corrosive atmosphere will also destroy inadequately protected cell surfaces. It has been found that an enamel finish, if complete coverage and satisfactory thickness have been obtained, will provide satisfactory protection.

Hazardous locations . . . Unfortunately there are applications which, because of highly corrosive or hazardous atmospheres, require the utmost of precaution in design. It will be most convenient to consider these designs through a study of the various equipment types used.

First, for lighting distribution, because the switching equipment is relatively small, it is practical to submerge entire panel boards in oil. This provides protection against corrosive atmospheres because these boards are excluded from active metallic surfaces. At the same time the circuit interruption occurs under oil, thus providing security in hazardous areas. These assemblies may be obtained in weatherproof enclosures and, hence, are suitable for outdoor applications. It is also possible to compensate tripping characteristics so that changes in ambient temperatures will not cause inconsistent operation.

Low-voltage distribution circuits which operate at 600 volts and below, and where the interrupting current does not exceed 10,000 amp., can be constructed in similar enclosures; i.e., individual breakers or panel-board arrangements may be submerged in oil, and the housing may be of weatherproof construction for outdoor installation.

Low-voltage large circuit breakers employ contacts which interrupt in air, and this makes these breakers unsuitable for submergence in an oil bath. Until recently the manufacturers have recommended using 5-kv. oil breakers for low-voltage power circuits in dangerous atmospheres. However, a 600-volt power breaker has recently been manufactured in an explosionproof housing. This is shown in Fig. 1. The breaker is of the "drawout design," and is cranked into position with jack screws.

So far as higher-voltage distribution is concerned, there have been several approaches to the design problems involved.

Other industries, as well as utilities, not beset with the atmosphere problems faced in the petroleum industry have wholeheartedly accepted metal-clad switchgear with drawout or vertical-lift breakers. The advantages in service continuity, the ease of inspection and maintenance, and the dependability through proper design are meeting a demand which is becoming more and more exacting as manufacturing-process interruptions become more costly.

The general acceptability of metal-clad switchgear has led to concentrated attention on specialized applications as well. However, it is obviously impractical completely to submerge large equipment and still retain the flexibility and accessibility inherent in standard metal-clad designs. Several compromises have been effected: One is a modification of the oil-bath design where components such as control switches and contactor panels are individually submerged. In this example the operating switches are available in a safe location, and instruments and relays are visible to the operator.

These normal advantages of metal-clad equipment are obtained by the use of bells over the meters and by the placing of control switches under oil. The lift-type oil breaker, on its transport truck, is shown in Fig. 2. The oil cups around each breaker stud assure that the slight arcing occasionally associated with the separation of the contact clusters cannot trigger an explosive volume of gas.

As was initially indicated, these oil-bath designs require more supervision and maintenance and, at the same time, are more difficult to maintain. Access is restricted, the compartmentation leads to massive construction, and the handling of volumes of oil is not always to be desired even in the petroleum industry.

Controlled atmosphere . . . Perhaps the simplest solution is to locate the switchgear in a room where the atmosphere is kept at a constant positive pressure. This will provide outward leakage, and will exclude corrosive or hazardous atmospheres.

However, the pressurized room requires a source of satisfactory air, and the latter may not be available. Also failure of the pressure system may lead to inward leakage and air contamination. Although this will not be serious if corrosion is the only problem, the risk may be undesirable if a hazardous atmosphere is encountered.

However, the use of pressurized atmospheres may be applied to the switchgear directly. This atmosphere is obtained from bottled nitrogen, which is used at the rate of approximately one bottle per cell per month. One advantage of this design is in the fact that the atmosphere can be kept clean and dry. This reduces the need for rigorous maintenance, and it permits longer periods between operations.

Switchgear Maintenance

As indicated previously herein, the reliable service is based first on the selection of proper equipment and, second, on the care given that equipment after its installation. The first concern of a maintenance program should be to plan its scope adequately and properly to train the personnel who will be charged with its functioning.

Schedule . . . The schedule should be definite as to the frequency of inspection, and it should establish precisely the devices to be checked and the operating condition to be classed as satisfactory. In addition, records must be kept of the work done and of the parts replaced, and a general description of the operating condition as a guide to future examinations must be maintained.

Personnel . . . So far as the personnel are concerned, these people must be completely familiar with the circuits in order to assure complete safety of operation. They should also be familiar with the sectionalizing of the switches or breakers which provide circuit isolation, so that the maintenance man personally can be satisfied as to the condition of the circuit on which he is working.

Disconnecting switches should be provided with interlocks, and tags should be used to assure against improper energizing of the circuits during the maintenance period.

The personnel must also be familiar with the equipment, so that access is rapid and direct. This requires a fairly complete file of readily available detail drawings.

Organic insulation . . . Perhaps the commonest source of switchgear failures can be traced to inadequately maintained insulation. The usual insulation is some form of organic material coated with varnish so that moisture will be excluded, and so that a smooth surface for cleaning will be provided. If the surface is broken, it should be sanded, cleaned, and revarnished with high-grade insulating varnish.

Inasmuch as a part of the insulation path to ground will usually be surface creepage on this organic insulation, it is essential that the surface be kept clean. This cleaning normally can be

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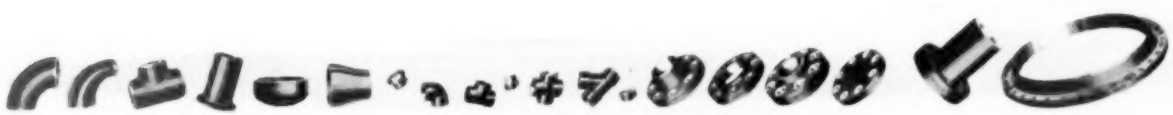

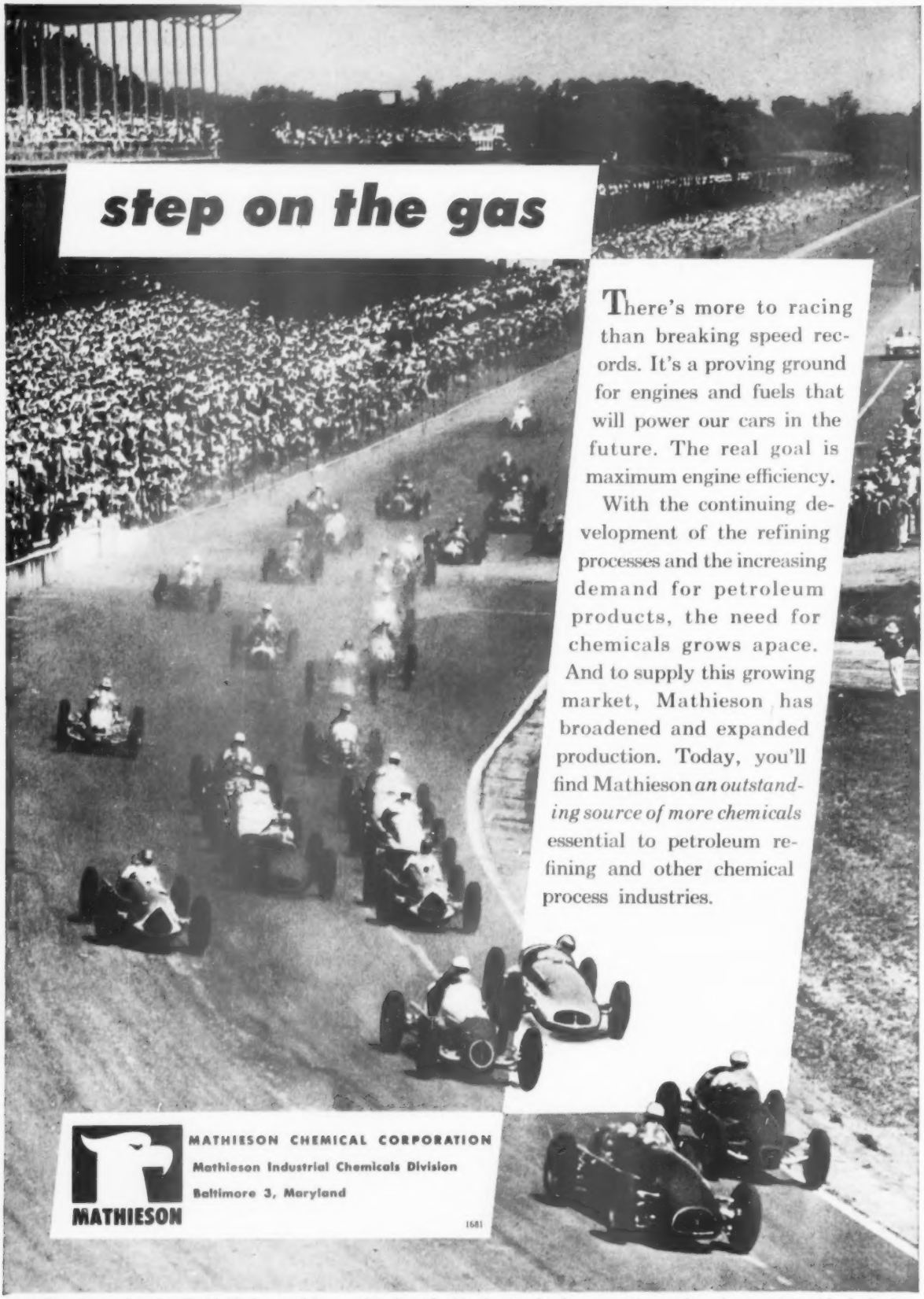

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accomplished with a dry cloth. However, for severe cases, the recommended method is to use towels soaked in heptane and then, after the heptane has evaporated, to wash the surface with distilled water.

Although the effect of dirt on the insulation resistance will be gradual, the addition of moisture will hasten an ultimate failure. This moisture may be most readily available in the form of condensation. The most effective way to avoid condensation is to maintain the air temperature above the dew point. This is usually accomplished indoors by the heating system within the building. However, in excessively humid indoor atmospheres or for outdoor designs, it is usually desirable to provide space heaters to warm the air in the switchgear.

It is extremely important that switchgear be given complete protection during storage or shutdown periods. At these times, without the heating effect of loaded circuits, condensation is very likely to damage the insulation permanently. Such condensation can be controlled best with space heaters.

Manufacturers are aware of many cases of abuse during installation periods. For example, if gear is improperly protected against concrete dust; if gear is standing in several inches of water; or if gear is standing in open fields without cover, irreparable damage to the equipment may result.

The use of megger readings has a definite value in a continuing maintenance program. Although a single reading is meaningless, a series of these readings, taken during periodic inspection activities, can indicate changing insulation effectiveness and give warning of future trouble.

Housing inspection . . . If the breakers are removable, the cell's moving parts, such as the elevator and shutter, should be cleaned; and such items as bearing parts and screw threads should be lubricated.

The control devices, meters, and protective relays should be maintained according to the instructions submitted with each device. Relay and meter checking is facilitated with designs which permit the operating element to be withdrawn from the case without the necessity of disconnecting the external wiring. Because of the test-circuit equipment involved, relay and meter maintenance is usually carried on by a specialized group, independently of the general maintenance program.

Breaker maintenance . . . Detail metal-clad breaker maintenance can best be performed with the aid of a test cabinet or rack which provides ready access to parts as well as an electrical operating means for checking breaker operation. This device should not be located in hazardous areas. Fig. 3 shows an oil breaker elevated at the test rack for contact inspection.

During a routine breaker inspection the wearing surfaces of the operating mechanism should be given a light coat of lubricating oil. However, trigger surfaces should not be oiled; and surplus oil should not be permitted to collect because it will provide a ready deposit area for dust and grit.

Circuit-breaker contacts should be examined for evidence of excessive burning. A moderate amount of pitting will cause no trouble because of the high contact pressure. Excessive roughness can be removed with a file or with sand paper, but care should be taken to avoid unnecessary shortening of the contact life. The breakers should be operated slowly by hand so as to assure the proper contact operation.

When metal-clad breakers are being inspected, the primary and secondary contacts should be examined for evidence of abnormal wear or overheating. Surface discoloration is not dangerous unless it is accompanied by rough deposits. These may be removed with crocus cloth. Before the breaker is inserted in the cell, a light film of vaseline should be applied to the primary and secondary contacts.

Insulating oil . . . The handling and care of insulating oil are so important and so involved that electrical manufacturers have found it desirable to provide instruction books on the subject. It is certainly recommended that maintenance groups be provided with this information. However, it is reasonably within the scope of this paper to cover periodic inspection procedures for insulating oil.

A satisfactory guide to inspection frequency may be obtained from a log of dielectric strength. When this strength drops to 20 kv., consideration should be given to processing the oil. The strength should never drop below 16.5 kv.

The periodic inspection should include a check of the oil level. Low oil may cause an insulation breakdown or a flashover of bushings. This can also lead to the failure of a circuit breaker to interrupt heavy overloads.

The dielectric strength of the oil should be determined and logged. When the strength is between 20 kv. and 16.5 kv., the oil should be purified. It is particularly important to check this strength after a severe overload operation of a circuit breaker.

Carbon in circuit-breaker oil lowers the dielectric strength of the oil; and, if it is deposited on insulating surfaces, the resistance of the latter is reduced. Visual inspection of oil samples should be made and, if appreciable carbon is present, the oil should be reconditioned even though the dielectric test appears satisfactory.

A helpful key to maintenance schedules will be found in the breaker operation. For highly repetitive duty, inspections should be made at either 2,500 or 5,000 operations, as indicated by the operation counter. If the breaker is required to switch only normal load currents and moderate overloads, the 5,000 figure should be used. If the breaker is relayed so that it will trip on system faults in addition to being used for load switching, the 2,500 figure should be used.

Schedule periods . . . The desirable frequency of inspection will be influenced by two factors:

1. The atmosphere may affect the life and reliability of the equipment in relation to the corrosive elements or the contamination which it may introduce into the switchgear.

2. The severity of operational duty is important so far as continuous and interrupting capacities are concerned.

Under reasonably ideal conditions (for example, in central-station applications), adequate maintenance can be provided by an annual program.

Depending on the degree of contamination present, it may be necessary to shorten the intervals to three-month periods. If conditions are known to be severe, it is recommended that the first schedule be established on the 3-month interval basis.

The influence of the second factor, viz., the operating duty, can be measured by the guide in Table 1 for metal-clad breakers.

As the maintenance program progresses, it will be found necessary to rebuild worn equipment. This is done from a stock of renewal parts which must be readily available. The parts stocked should be according to the manufacturer's recommendations, and must be kept reasonably complete.

TABLE 1—FREQUENCY OF OPERATION DUTY

Operation	Light duty: i.e., 5 Operations Per day (Months)	Moderate Duty: i.e., 15 Operations Per day (Months)	Heavy Duty: i.e., 30 Operations Per day (Months)	Very heavy Duty: i.e., 60 Operations Per day (Operations)
Clean external surfaces	3	3	2	2,500 to 5,000
Inspect contacts	6	3	2	2,500 to 5,000
Inspect mechanism	12	6	4	2,500 to 5,000

GRAPHITIZATION . . . *in refining equipment*

Its extent • hazards • research

by R. J. Fiorentino* and A. M. Hall*

WHILE cases of graphite formation have been observed in petroleum and power-plant equipment,[1,2] no instances of failure specifically attributable to graphitization have actually occurred in the refining industry.

Failures in three catalytic cracking units, in which graphitization was present, were reported in 1951.[3] These units were constructed of integral-clad steel plate composed of A.S.T.M. Specification A 201, grade "A," carbon-steel backing with A.E.S.I. (American Iron and Steel Institute) 347 stainless-steel cladding.

The failures took the form of cracks up to 8 ft. long, and they appeared to have originated at or near the edge of weld-heat-affected zones. The cracks occurred at the edge of longitudinal and girth welds, as well as at the edge of fillet welds by which nozzle necks or manhole reinforcing pads were attached to the shell. Cracks were also observed, to a greater or lesser degree, in the stainless-steel weld metal used with the cladding on the inside of the vessels. In only one of the three units were concentrations of graphite found in the carbon-steel backing to an extent which might have weakened the structure. In this unit nodules of graphite were observed to be located in some of the cracks, and these nodules may have influenced the paths of propagation of these cracks. However, it could not be said that graphitization had been a direct cause of the failures. In fact, the general appearance of the cracks was strongly suggestive of stress rupture accompanied by intergranular oxidation.

Since, in addition to comparatively harmless random type of graphitization some tendency has also been found for graphite to concentrate near welded joints, it was felt by the refining industry that a reexamination of the equipment was desirable. Segregated graphite is undesirable anywhere in a structure because of its direct weakening and embrittling effects, and because it constitutes a possible point of stress concentration. The possible hazard of this situation is increased when concentrated graphitization occurs at welded joints.

The A.P.I. subgroup initiated a project on graphitization in petroleum refining equipment at Battelle Memorial Institute on May 1, 1952. The major objectives of this program are:

1. Determination of the present extent of graphitization in equipment.

2. Estimation of the future course of graphitization in presently graphitized and ungraphitized equipment.

3. Establishment, if possible, of a factual basis for specifying plain-carbon steels which will be satisfactorily resistant to graphite formation.

The A.P.I. subgroup invited participation, especially by those with pressure vessels operating at temperatures in excess of 800° F. It was recommended that samples be taken of carbon and carbon molybdenum-steel vessels and pipe which had operated a sufficient length of time to warrant investigation for evidence of graphitization; 4 years' operation (35,000 hours) was considered a reasonable minimum time limit for sampling unless the equipment had been operated in a temperature range of not less than 950° F. In the latter case the equipment might be sampled considerably earlier.

If the sample contained a weld and was of sufficient size, it was cut into three pieces transversely to the weld, as illustrated in Fig. 1. The middle piece was machined to ⅛-in. thickness for a bend test. One outer piece was so

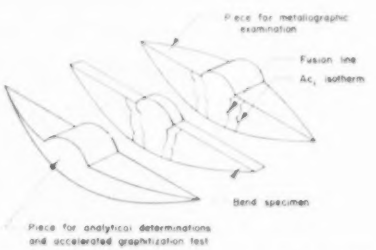

Fig. 1—Schematic drawing of typical graphitization "boat sample."

cut that the weld, in both heat-affected zones and in the unaffected parent metal on both sides of the weld, could be examined metallographically.

The bend-test specimen was macroetched with 10 per cent nital to reveal the weld and the weld-heat-affected zones. Two bends were then made in the specimen in such a way that the root of each bend was at the low-temperature edge of a weld-heat-affected zone.

Making Tests

The purpose of the metallographic examination and the bend test was to obtain information on point No. 1 of the program, viz., determination of the extent, if any, of damage done by graphitization.

The other outer piece was used for spectrographic and chemical analyses.

*Battelle Memorial Institute, Columbus. From paper presented at A.P.I. division of refining meeting, New York, May 1953.

Results of Research By A. P. I. Committee

The A.P.I. Committee on Refinery Equipment authorized formation of a Subgroup on Deterioration of Steels at High Temperatures. This subgroup has sponsored a project on graphitization at Battelle Institute with results as follows:

1. To date, no instances of failure in refinery equipment have been observed in which graphitization could be considered either as the direct cause or as an important contributing factor.

2. In 8 out of 131 plate-steel samples (6.1 per cent) the extent and form of graphitization were such as to cause the specimens to crack in a cold-bend test.

3. Although several pipe-steel samples were considered to have graphitized "severely," material available was insufficient to permit determination of cold-bend properties.

4. Continuous "eyebrow" type of graphite formation, as found in the power industry, was not observed in any case.

5. None of the carbon-molybdenum steels thus far examined, whether plate or pipe, showed any evidence of graphitization. However, this finding must be viewed with caution because carbon-molybdenum steels have been known to graphitize.

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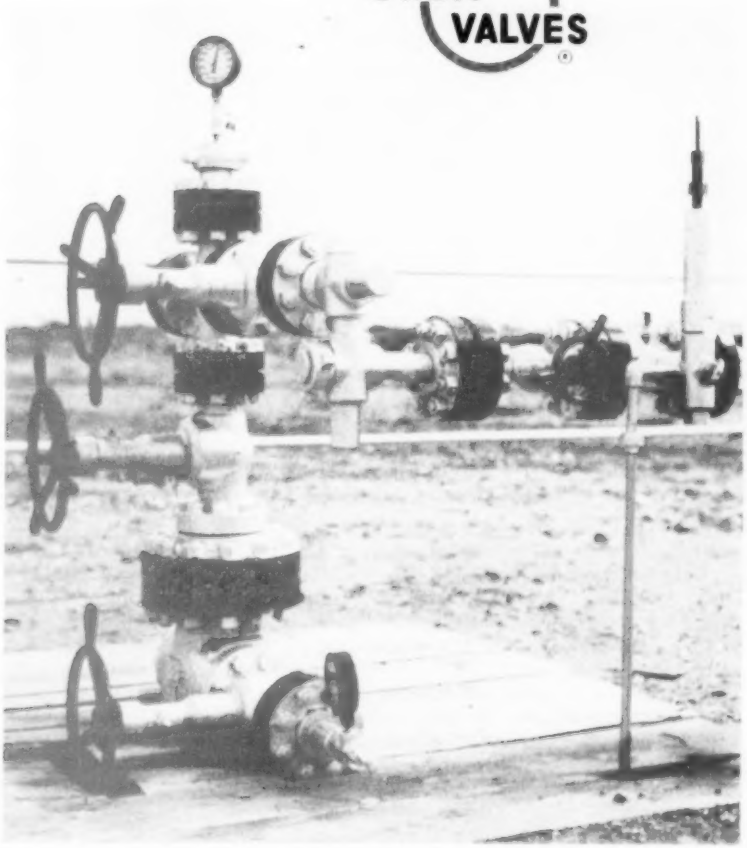

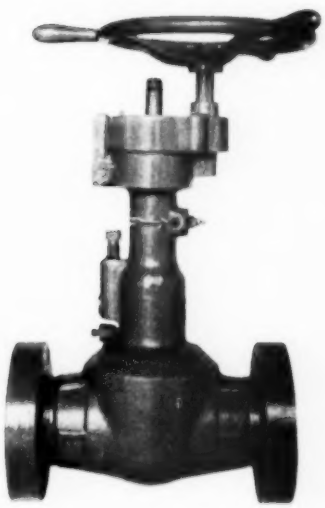

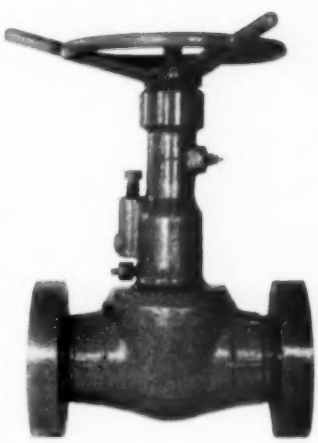

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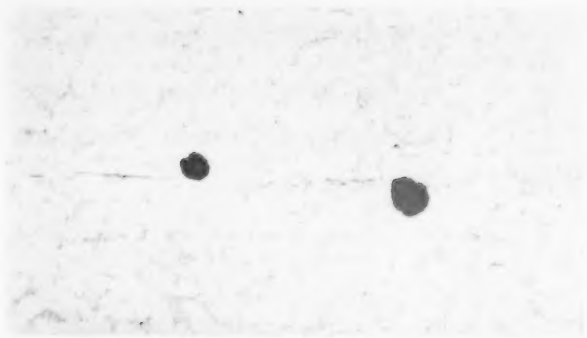

Fig. 2—Small-to-moderate-sized graphite nodules in unaffected parent metal.

Fig. 3—Large graphite nodule in unaffected parent metal.

Fig. 4—Graphite particles at the low-temperature edge of the weld-heat-affected zone of a specimen.

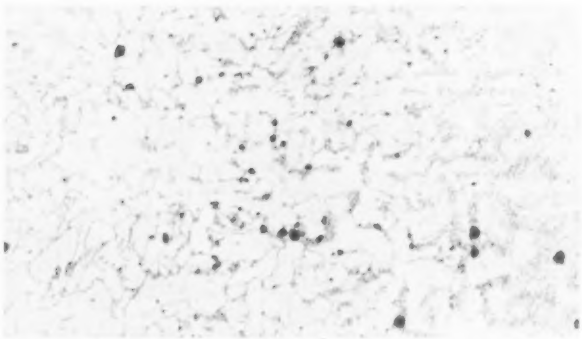

Fig. 5—Graphitization at the low-temperature edge of the weld-heat-affected zone of a sample which failed in the cold bend test.

Later on in the program it appeared that nitrogen might be an important element which inhibits graphitization. Accordingly, in the more recent examinations, the analytical work has been directed toward the determination of nitrogen, total aluminum, and silicon. The major purpose of the analytical work was to obtain information which might help establish whether a satisfactory graphitization-resistant plain-carbon steel is obtainable. This is point No. 3 of the program.

The same piece which had been used for analytical work was reserved for an accelerated graphitization test. This treatment consisted of holding the specimen for 1,000-hour periods at 1,025° F.—a temperature known, from previous work on the graphitization of steam-piping steels,[4] to promote graphite formation at a substantially higher rate than that obtained at temperatures of from 800° to 950° F., the range of greatest interest from the standpoint of refinery operations.

The accelerated test samples were examined with the microscope for evidence of graphitization, and then returned to the furnace for an additional period at 1,025° F. This test was directed toward point No. 2 of the program; i.e., it was designed to aid in estimating the future course of graphite formation in presently graphitized equipment, and in estimating the graphitization susceptibility of the steel used in presently ungraphitized equipment.

In addition, a McQuaid-Ehn test was made on several samples to determine whether information pertinent to the graphitization problem could thereby be obtained. It had been observed in investigations of graphitization in steam piping that the results of this test could be correlated with the susceptibility of the steel toward graphite formation.[5] Specifically, a tendency had been reported for steels which were "normal" in the McQuaid-Ehn test to be resistant, and for steels "abnormal" in the test to be susceptible toward graphitization.

What the Tests Showed

At the time this report was written, 170 samples had been received from 12 participating companies. Of these samples, 159 had been examined with the microscope and analyzed spectrographically and chemically. In addition, an accelerated graphitization test of 1,000 hours at 1,025° F. had been completed on 65 samples.

1. Plate samples . . . The 159 samples examined included 131 representing plate and 28 representing pipe. In 86 of the plate-steel samples no evidence of graphitization was observed. Of the other 45—which did graphitize—the extent of graphitization in 25 was considered to be slight, and had no influence on the bend ductility of the samples. In this group of samples graphite formation varied from a few scattered nodules of small-to-moderate size, as illustrated in Fig. 2, to very occasional but fairly large nodules, as shown in Fig. 3. Slight graphitization at the low-temperature edge of a weld-heat-affected zone is illustrated in Fig. 4.

In 22 plate samples a tendency was observed for the graphite to concentrate in the vicinity of the low-temperature edge of the weld-heat-affected zone. The extent of graphitization in 2 of these samples was considered "slight"; in 13 it was considered "moderate"; and in 7 it was regarded as "severe." The bend-test specimens cut from the severely graphitized samples and from one of the moderately graphitized samples broke at the weld-heat-affected zone, and metallographic examination indicated that graphite formation had been influential in causing the fracture. The extent of graphitization in one of the severely graphitized samples is illustrated in Fig. 5. That in another is shown at low magnification in Fig. 6. The samples which had graphitized sufficiently to break in the bend test represented three reactors.

The appearance of a bend-test specimen which has fractured along the

Fig. 6—Severe graphitization in a weld-prober sample, at low magnification.

low-temperature edge of the weld-heat-affected zones, as a result of graphite concentrated at these zones, is shown in Fig. 7. Frequently fractures occurred at right angles to the bend axis, along stringers of non-metallic inclusions in the metal. These breaks were not influenced by graphite formation. Their appearance is illustrated in Fig. 8.

2. Pipe samples . . . In 11 of the 28 pipe samples, no evidence of graphite was found. Among the other 17—which did graphitize—the extent of graphitization in 4 was considered slight; in 5 it was considered moderate; and in 8 it was rated severe. Unfortunately, in no instance where the extent of graphitization was considered severe, was there a sufficient sample to permit making a bend test.

McQuaid-Ehn tests . . . This test was carried out on 19 samples. As expected, it was found that the results could be correlated quite well with total aluminum content. The test did not appear to give additional information applicable to the graphitization problem.

Accelerated Graphitization Tests

In six samples where graphitization had already been observed as a result of service, the accelerated test suggested that further graphitization could definitely be expected. In these instances the samples showed a tendency toward the formation of graphite concentrations in regions related to the welding cycle.

In 10 samples where no graphite had been observed as removed from the refinery equipment, the results of the accelerated test showed that the steels represented were definitely susceptible to graphitization. However, there appeared to be differences in degree of graphitization susceptibility. In some cases, even though susceptibility was shown by a steel which had not graphitized in service, there seemed little probability that graphite would actually form in service because of the low metal temperatures involved.

The results of the accelerated graphitization test are discussed from the viewpoint of steel composition and melting practice in the following section.

Composition and Steel-Making Practice

When the progress of other research on graphitization indicated that nitrogen tended to inhibit graphitization, the analytical work was directed toward determination of total aluminum, silicon, and nitrogen. The amount of sample available necessarily limited the number of analyses which could be made per sample.

The accumulated analytical data were examined from many viewpoints in an effort to determine whether consistent relationships existed which had a bearing on the extent of graphitization observed. Service time, average service temperature, and the type of steel (whether plate or pipe, as well as whether carbon, carbon-silicon, or carbon-molybdenum) were also taken into account.

The temperature values usually reported appeared to be "stream temperatures" rather than "metal temperatures," and a reliable estimate of metal temperature could not be secured.

The influence of service temperature was studied in relation to the aluminum and silicon contents of the steels. Samples of steel in service at any temperature for at least 35,000 hours were used. Although no close correlation with either aluminum or silicon content seemed evident, it was observed that, except in one case (carbon steel: A.S.T.M. Specification A 285, containing 0.042 per cent aluminum and 0.21 per cent silicon), only slight graphitization, if any, occurred at average service temperatures of less than 890° F.

The statistics relating the type of steel to graphitization extent are as follows:

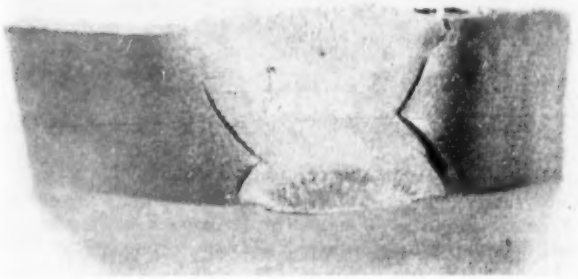

Fig. 7—Bend-test specimen, showing fractures along low-temperature edge of weld-heat-affected zones as result of graphite formation.

Fig. 8—Bend-test specimen, showing breaks at right angles to the bend axis along stringers of nonmetallic inclusions in the metal.

Plate Steels

A.S.T.M. Specification:	Number of Samples — A 285 (A 70) (Carbon)	A 201 (Carbon-Silicon)	A 204 (Carbon-Molybdenum)
Extent of graphitization:			
None	26	36	15
Slight	6	19	
Moderate	2	11	
Severe		1	

Pipe Steels

A.S.T.M. Specification:	Number of Samples — A 161 (Carbon or Carbon-Molybdenum)	A 106 (Carbon)	A 206 (Carbon-Molybdenum)
Extent of graphitization:			
None		6	5
Slight	1	3	
Moderate		5	
Severe		8	

This tabulation appears to suggest that carbon-steel plate (A 285 and A 70) is more resistant to graphite formation than is carbon-silicon plate (A 201), whereas carbon pipe steel is quite susceptible to graphitization. However, it was noted that the majority of the carbon plate steels were used at temperatures below 900° F., whereas most of the carbon-silicon plate steels were used in the range from 900° to 1,000° F., and several were used at temperatures well in excess of 1,000° F. On the other hand, many of the carbon pipe steels were used at temperatures in excess of 1,000° F.

Therefore, it could be said that, on the average, service temperature was more severe for the carbon-silicon plate steels than for the carbon plate steels. Thus the tabulation actually reflects severity of service conditions, rather than performance of type of steel, in the case of the carbon and carbon-silicon steels.

The tabulation also shows that in no case did either the carbon-molybdenum plate steels (A 204) or the carbon-molybdenum pipe steels (A 206) show any evidence of graphitization. The results tend to confirm the experience of the power industry to the effect that carbon - molybdenum steam - pipe steels were found to be somewhat more resistant to graphitization than plain-carbon steels. However, the power industry found numerous cases of graphite formation in carbon-molybdenum steels and now favors chromium-molybdenum steels, which contain more than 0.5 per cent chromium; i.e., A 315, for steam piping to be used at service temperatures of not less than 950° F. Therefore, caution must be used in assessing the results presented herein on the carbon-molybdenum steels.

Accelerated Graphitization Tests

The group of samples given the accelerated graphitization test of 1,000 hours at 1,025° F., was also studied for effects due to composition and type of steel.

It was considered significant that none of the 10 carbon-molybdenum steel samples tested showed any evidence of graphite formation after test. This group was composed of eight plate steels (A 204) and two pipe steels (A 206). The aluminum content of these steels ranged from 0.002 to 0.065 per cent, whereas silicon varied from 0.10 to 0.32 per cent. No nitrogen analyses were available for any of these particular steels.

Among the other specimens given the accelerated test, the results were as follows:

A.S.T.M. Specification:	Number of Specimens — A 285 (A 70) (Carbon Plate)	A 201 (Carbon-Silicon Plate)	A 106 (Carbon Pipe)
Extent of graphitization			
None	18	19	1
Slight	3	14	
Moderate	1	5	1
Severe		3	
Graphitization unchanged by test	17	21	2
Graphitization increased by test	5	10	0

The three severely graphitized specimens contained 0.030, 0.030, and 0.073 per cent aluminum, respectively, with corresponding silicon contents of 0.16, 0.18, and 0.20 per cent. The aluminum content of the moderately graphitized specimens ranged from 0.002 to 0.030 per cent, with silicon varying from 0.01 to 0.22 per cent.

What Kind of Steel?

Although no instances of failure due to graphitization have occurred, some vessels have been built with internal insulation to reduce metal temperatures. Other vessels have been constructed from graphitization - resistant alloy steels. Still others are being built of carbon steels.

Insofar as new equipment is concerned, the question of the kind of steel to use becomes of major importance, whether graphitization should be considered a definite cause, or even a probable cause of failure. The results of the investigation thus far have shown that neither carbon steels, such as made to A.S.T.M. Specification A 285, nor carbon-silicon steels represented by A.S.T.M. Specification A 201, are immune to graphitization. Moreover, both types are apt to develop undesirable concentrations of graphite in weld-heat-affected metal. No simple relationship seems to exist between graphitization susceptibility and such variables of composition as total aluminum, silicon, and nitrogen.

The strongest lead, in the matter of composition, is the immunity toward graphitization thus far shown by the carbon-molybdenum steels. However, this finding must be viewed with caution because carbon-molybdenum steels are known to graphitize.[6] The results indicate that carbon-molybdenum steels are markedly more resistant to graphitization in refinery equipment than are the carbon and carbon-silicon steels tested. They may prove to be satisfactorily resistant for the purposes of the industry. This remains to be demonstrated by the results of continued investigation.

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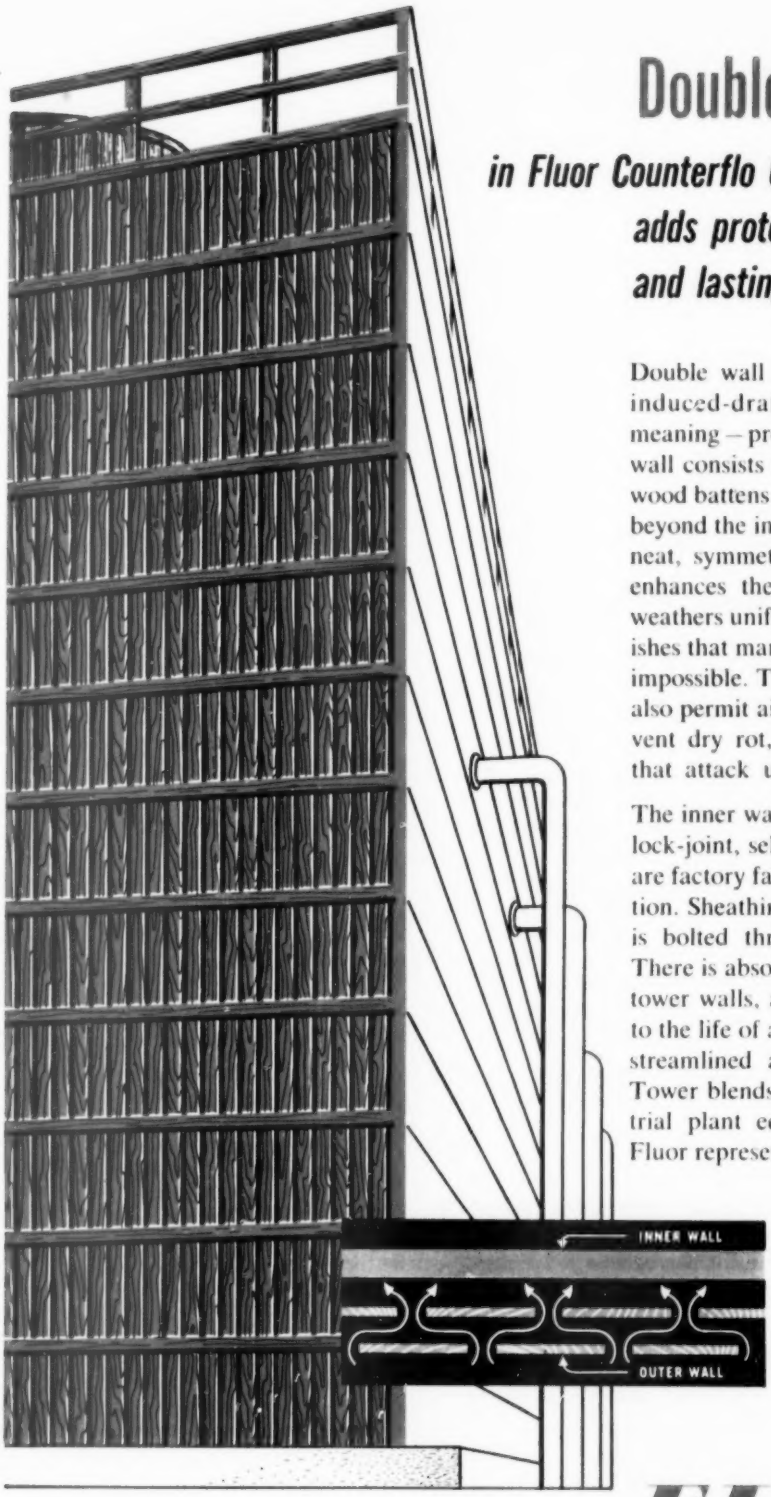
Kansas Oil-Field Brines

Oil operators in Kansas fields may be able to use water flooding more efficiently in secondary recovery of oil from formations where natural pressure is exhausted. Information leading to this end is contained in a report released recently by the Bureau of Mines. Analyses of 600 brine samples from various Kansas oil fields are arranged according to field names in the report.

Knowing the chemical makeup of the brine already in the formation enables the operator to design an effective water-flood project and to treat injection water to obtain the best possible oil recovery. Brine analyses are also of value in interpreting information supplied by electric logging devices.

The report also describes the methods used in collecting and analyzing the brine samples.

A free copy of Report of Investigations 4,974, "Analyses of Formation Brines in Kansas," can be obtained from the Bureau of Mines, Publications Distribution Section, 4800 Forbes Street, Pittsburgh 13, Pa.



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Thermofor Continuous Percolation . . .

. . . new process for decolorizing lubricating oils

by L. P. Evans,* K. E. Magin,* J. I. Savoca,* and H. W. Shea*

THE Thermofor continuous percolation process, which has been developed for decolorizing lubricating oils, has a substantial lower investment cost than conventional static-bed percolation, and has a distinct advantage over hot contacting because of lower operating costs. The process, which has been proved in pilot-plant work, is being put into commercial application on a 2,100-bbl. per day unit now under construction at Coryton, England. A 3,000-bbl. per day plant has been licensed for erection in Holland. Numerous other T.C.P. projects are now under consideration.

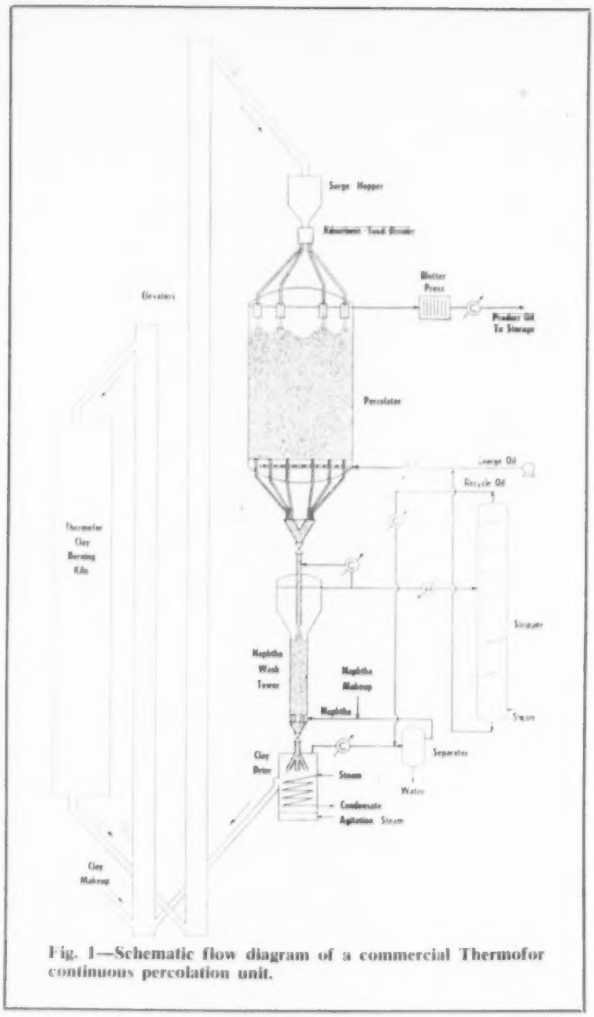

Fig. 1—Schematic flow diagram of a commercial Thermofor continuous percolation unit.

. . . Development Program

Laboratory-Scale Studies

Two types of equipment were employed for this work. The first type, used to study major process variables, consisted of several adiabatically heated columns ranging up to 6 in. in diameter and 25 ft. in height. The second type comprised large-scale models in which the flow characteristics of the liquid and solids streams could be studied to develop data for commercial design. A pilot unit was also built to study the clay-drying operation.

The unfiltered oils used in this work included both solvent-refined and acid-treated lubricating-oil stocks as well as waxes. These stocks were typical of those processed in the conventional percolation plant in Socony-Vacuum's Paulsboro, N. J., refinery.

*Socony-Vacuum Research and Development Laboratories, Paulsboro, N. J. Presented at midyear meeting, A.P.I. Division of Refining, New York, May 13, 1953.

Percolation Step

Oil rate . . . As oil rate through the percolation column is increased, a rate is reached above which the clay bed expands markedly. For efficient decolorization, oil rate should be kept below this point, where the bed is in compact form. This critical point is a function chiefly of the viscosity of the oil stream, with density and size of clay a minor factor.

By adjusting oil-stream viscosity to 5 cp. or lower, oil-throughput rates of 10 to 20 bbl. per day per square foot of column can be obtained. This adjustment can be made entirely by temperature, thus eliminating the need for naphtha dilution, even on heavy stocks. Temperatures corresponding to a viscosity of 5 cp. range from about 125° F. for transformer oils to 350° F. for heavy residual stocks.

Bed depth . . . When operation proceeds at the above throughput rate, the yield of decolorized oil increases steadily as bed depth is increased up to about 10 ft. Beyond this point yield improves slightly and levels off at a bed depth of about 20 ft.

Yields . . . When operation proceeds within the prescribed range of oil rate and bed depth, continuous countercurrent percolation gives about 10 per cent higher yields of decolorized oil in barrels per ton of clay throughput.

Product quality . . . Lubricating-oil products prepared by continuous percolation at higher temperature without naphtha dilution are comparable in quality to those from conventional percolation with naphtha dilution. This is shown by the data in Table 1.

Microwaxes, and transformer and

TABLE 1—PROPERTIES OF LUBRICATING OILS DECOLORIZED BY CONTINUOUS (T.C.P.) AND FIXED-BED PERCOLATION

Type of finished stock—	Solvent-treated Mid-Continent bright stock		S.A.E. 30 blend of solvent-refined distillate and bright stock		S.A.E. 30 blend of acid-refined distillate and and bright stock		Acid-treated naphthenic heavy distillate		Solvent-treated Mid-Continent residuum		Solvent-refined naphthenic distillate	
Method of percolation—	Static bed	Continuous	Static bed	Continuous	Static bed	Continuous	Static bed	Continuous	Static bed	Continuous	Static bed	Continuous
Processing data:												
Operating temperature, °F.	125	300	120	260	150	270	120	370	120	350	150	250
Bed height, ft.	25	10	25	10	25	10	25	10	25	10	25	10
Product rate, bbl. per day per sq. ft.		8.6		17.1		17.1		8.6		8.6		8.6
Naphtha dilution normally required	Yes	No	No	No	No	No	Yes	No	Yes	No	No	No
Properties of product oils:												
Gravity, °A.P.I. at 60° F.	27.7	27.3	29.5	29.6	26.1	26.0	21.5	21.7	26.6	26.3	25.3	25.3
Flash point (Cleveland open cup), °F.	480	495	440	425	440	425	530	525	565	585	430	435
Viscosity (Saybolt Universal), sec.:												
At 100° F.	1,170	1,240	441	449	597	612	3,870	3,370	2,400	2,700	541	525
At 210° F.	95.6	98.2	61	61.4	66	67	148	141	146	157	59	58.7
Viscosity index	95	95	101	100			55	54	95	95	61	62
Color, A.S.T.M.	6+	6+	1½	1½	6—	6—	8	7+	7+	7+	2½—	2½—
Neutralization No.	Nil	Nil	Nil	Nil	0.01	0.01	0.38	0.04				
Carbon residue (Ramsbottom), per cent by weight		0.2	0.1	0.2	0.5	0.6		0.4				
Yields: Barrels of oil per ton of clay:												
Laboratory: continuous	39		14		120		6.9		60		40	
Plant: static bed	22		6		49		5.6		27		24	
Laboratory: static bed	35		14		79				49		32	
Ratio: continuous to laboratory static	1.11		1.00		1.52				1.23		1.25	
Ratio: continuous to plant static	1.77		2.34		2.45		1.17		2.22		1.66	

TABLE 2—QUALITY OF MICROWAX AND TRANSFORMER OIL PRODUCED BY T.C.P. PROCESSING

Product—	Microwax		Transformer oil	
	Desired properties	T.C.P. product	Desired properties	T.C.P. product
Yield, bbl. of oil per ton of clay*		4:1		4.5:1
Percolation temperature, °F.		300		130
Product properties:				
Gravity, °A.P.I. at 60° F.	36.0	34.6	28.4	28.5
Viscosity (Saybolt Universal) at 210° F., sec.	75	76	33.5	33.6
Color, A.S.T.M.	2½	2	†1	1—
Needle penetration at 77° F.	22/32	25		
Cast		OK		
Odor		(‡)		
General Electric bomb sludge, per cent by weight			†0.025	0.017
Sludge accumulation, per cent by weight per 14 days			0.18	0.17
Resistivity at 185° F., ohms per centimeter times 10^{12}			500	2,200

*T.C.P. percolations conducted on equilibrium clay. †Maximum. ‡Satisfactory.

TABLE 3—OIL RECOVERY IN NAPHTHA-WASHING STEP—CONTINUOUS VS. STATIC-BED OPERATION

(Charge oil: Solvent-treated Mid-Continent residuum; A.S.T.M. color, 7—. Clay: Equilibrium 30 to 60-mesh fuller's earth)

	Continuous		Static	
Volume of wash naphtha per volume of clay*	1.0		1.0	
	Per cent	A.S.T.M. color	Per cent	A.S.T.M. color
Recovered oil*	88	8—	65	8
Steamings			21	Very dark
Color bodies and nonrecoverable oil	12		14	

*Drained clay from either process, as charged to washing, retained oil about equal to the weight of the dry clay.

turbine oils, also can be produced in satisfactory quality without the special precautions required for these stocks in conventional percolation. These products are generally sensitive with respect to properties other than color (such as odor, cast, and resistivity.) For example, in the case of microwaxes this usually requires naphtha dilution and clay segregation.

With transformer oils it is common practice to use fresh burned clay entirely—a very costly item. Data presented in Table 2 show that, with continuous percolation, it is possible to make both types of products using only "equilibrium" clay and no dilution.

Flow studies . . . Following are some general observations which form the basis for the process design:

1. The top of the percolation column should be designed to insure uniform distribution of the fresh clay across the column with no carryover of clay, either by entrainment or flotation. Entrainment of fine clay particles is minimized by providing a settling zone above the clay bed. Flotation of coarser particles is prevented by allowing the fresh (dry) clay stream to drop through confined quiescent sections in the upper half of this settling zone.

Complete deaeration of the feed clay

also takes place in this zone. The oil-soaked clay spreads rapidly across the bed due to the upward oil velocity, which permits wide spacing of the clay inlet pipes.

2. The bottom of the column should be equipped with manifold systems for uniform oil distribution and clay withdrawal. The clay drawoff system should operate with minimum downflow of oil with the spent clay. A multipipe arrangement is practical for this purpose. Suitable mechanical means can be provided to control the rate of clay discharge from these pipes. Such a system permits withdrawal of spent clay in a slurry containing not more than one volume of oil per volume of clay.

Naphtha washing . . . The naphtha-washing step is designed to recover the oil from the spent-clay slurry received directly from the percolator. This step involves continuous countercurrent flow of naphtha and clay in a column similar in general design to the percolator. A column height of 10 ft., with an enlarged settling zone at the top, is adequate for the wash tower. A paraffinic naphtha of intermediate (240° to 340° F.) boiling range is preferred for this operation.

The washing efficiency obtained with continuous countercurrent operation is better than with the static-bed process. This is shown by laboratory test data in Table 3. These tests were made on a spent clay from percolating a paraffinic residual oil. The spent-clay mixture contained about 50 per cent of oil plus color bodies by weight. The static washing test included the usual steaming operation at the end of the washing cycle.

It will be noted that continuous washing gave very efficient recovery of oil with little color-body removal from the clay. This oil can be recycled to the percolator with no penalty in over-all yield. The static operation gave 23 per cent less recovery of recycle oil, and a corresponding amount of "steamings." The latter is a very dark oil suitable only for fuel-oil blending and, therefore, constitutes an actual net loss of lubricating-oil product.

This proportion of the total oil in the clay degraded to "steamings" in the static process appears to be in the range of 15 to 25 per cent for all stocks. The total oil loss per ton of clay handled is thus about two to three times as high for static percolation as for continuous percolation.

Clay drying . . . This step is required to effect complete removal of the naphtha carried with the spent clay from the washing step. The experimental equipment used for this study comprised a simple tank equipped with steam-heating coils. The wet clay was charged continuously into the tank, and it dispersed into a bed which was agitated by a small amount of steam or flue gas entering at the bottom.

Sufficient heat was supplied by the coils to flash off the naphtha and permit continuous withdrawal of dry clay from the top of the bed. Heat-transfer rates up to 6,000 B.t.u. per hour per square foot of coil surface were found to be practical for this operation, using 160-lb. steam in the coils. This unit operated satisfactorily at clay throughput rates up to 10 tons per day.

The clay emerges from the drier moisture free because of the temperature (350° to 400° F.) in the bed. By contrast, the steamed clay obtained in conventional percolation usually contains 10 to 12 per cent moisture. This moisture has a tendency to deactivate the clay.

500-Bbl. Per Day Pilot Plant

A 500-bbl. per day moving-bed pilot plant was installed at Socony-Vacuum's Paulsboro refinery, adjacent to its conventional percolation plant.

Charge stocks . . . The charge stocks used were those available in sufficient quantity in the refinery schedule during the test period. They included two bright stocks and one heavy neutral stock. For convenience, these stocks were percolated in naphtha solution, paralleling the filter-plant operation.

Throughput rates ranged from 225 to 1,250 bbl. per day of solution. Individual runs extended over 10-day periods. Laboratory static percolations were made using the same oil and clay to check the efficiency of the 500-bbl. per day runs.

Yields . . . The product-oil yields (barrels per ton of clay) from the 500-bbl. per day unit were about 10 per cent higher than from laboratory static percolation. This checks the efficiency found in laboratory continuous percolation, and demonstrates that no efficiency is lost in enlarging the scale of the continuous process.

The commercial static percolation yields, however, are lower by a factor of 2 to 3. The quality of the products from the continuous operations was identical to that of the refinery products in all respects.

. . . Process and Mechanical Design Of Commercial Units

A T.C.P. unit may be divided into a percolation section, a naphtha-wash section, and a regeneration section. The percolation section includes a decolorizing tower and its auxiliary equipment for feeding and withdrawing oil and clay. The naphtha-wash section includes a wash tower, with its auxiliary equipment, and a clay drier. The regeneration section consists of a Thermofor clay-burning kiln, and the elevators and conveyors for transporting the clay.

A schematic flow diagram for a commercial T.C.P. unit is shown in Fig. 1.

Oil percolation . . . The oil to be decolorized is preheated and introduced into the bottom of the percolation tower through a multinozzle distributor. The product oil is taken overhead through a blotter press to remove traces of entrained clay; it is cooled; and it is then sent to storage.

Regenerated clay from the kiln is fed into the top of the percolator and distributed over the cross-section of the tower through a number of feed legs. The clay falls through the oil in the settling zone, and merges with the clay bed. The rate of clay feed is adjusted to give the desired product color. The spent clay is withdrawn from the bottom of the percolator through a multipipe drawoff system. The drawoff rate is controlled automatically to maintain a constant bed level in the percolator. About an equal volume of oil is discharged from the tower with the spent clay.

Clay washing . . . The spent-clay stream from the percolator drops into the top of the wash tower, and the spent clay is washed countercurrently with naphtha in an operation similar to the percolation step. The naphtha-oil solution taken overhead is charged to a stripper where the naphtha and oil are separated. Stripped oil is recycled to the percolator with the fresh feed, and the naphtha is returned to the wash system.

A portion of the wash-tower overhead stream may be cooled and recycled, if necessary, to prevent boiling of naphtha by contact with the hot oil-clay slurry in the top of the wash

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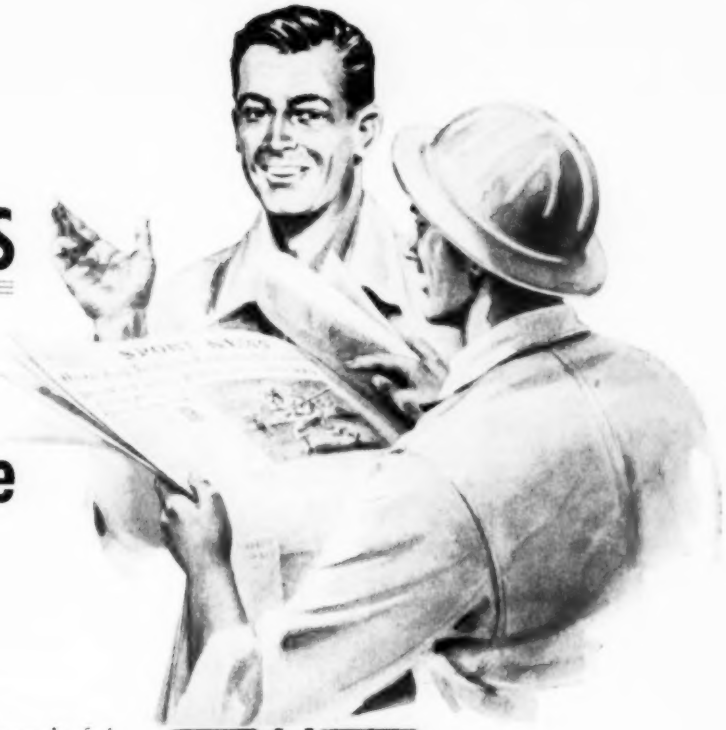

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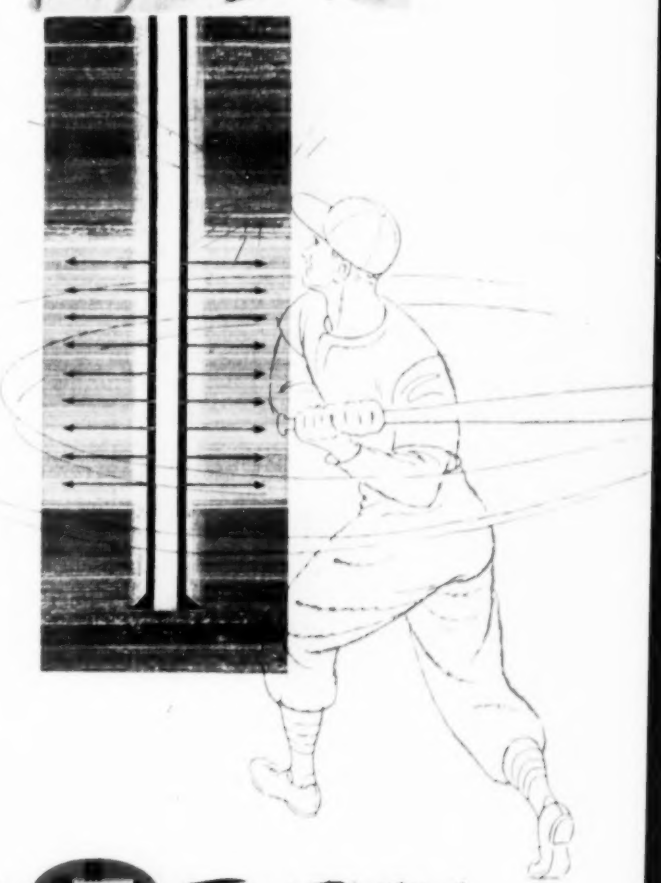

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tower. The control of bed level in the wash tower is similar to that in the percolator.

The washed clay, containing some naphtha, enters a drier of the type previously described, from which dry clay free of naphtha is withdrawn continuously. The naphtha vapor from this drier is condensed and recycled to the washing system. The dry spent clay is regenerated in a conventional Thermofor clay-burning kiln.

Block operation . . . The process has good flexibility for processing several stocks in the same unit. Pilot-plant experience demonstrates that, by proper scheduling of stocks, it is possible in most cases to eliminate slop-oil cuts during changeover periods. In some cases the percolation and washing sections may be divided into two or more small units rather than one large one.

Such division is desirable when a large variety of stocks is processed, particularly special stocks such as waxes which involve relatively small volumes or which are extremely sensitive to contamination. In such a plant a common drier and kiln would be used.

. . . Economics of T.C.P. Process

The economics presented in Table 4 are based upon extensive plant experience with static-bed percolation and hot contacting, and upon pilot-plant evaluations and semicommercial plant operating experience with the T.C.P. process. The operating costs tabulated include all of the costs which would be variable from process to process, but they do not include items of direct operating costs, such as laboratory expense, pumping and gaging, clerical, technical and engineering expense, and other small expenses which are assumed to be common to the three cases.

Initial investment required for the T.C.P. plant is about 20 per cent higher than the cost of a modern hot-contacting unit with a precoat filter. Nevertheless, the incremental investment of approximately $150,000 will be paid out in less than 1 year after taxes by the reduction in operating costs and lubricating-oil loss.

The T.C.P. process shows a very large economic advantage over static-bed percolation because of the very high investment requirement and the higher operating cost for the latter.

Inasmuch as the large majority of lubricating-oil manufacturers employ hot contacting, the economics of installing a new T.C.P. unit in place of an existing hot-contacting unit will be of interest, especially in the case where the hot-contacting unit does not embody the modern precoat filtration or may otherwise be obsolescent.

In this case an economic computation similar to that shown on Table 4 indicates that a T.C.P. unit installed in place of an existing hot-contacting plant can, under some conditions, be paid out in less than 4 years by virtue of reduced operating costs and increased lubricating-oil recovery.

Similarly, the conversion of even a modern static-bed percolation unit to continuous percolation will pay out in less than 4 years. Shorter payouts are indicated for the conversion of older, less efficient static-bed operations.

TABLE 4—ECONOMICS OF T.C.P., HOT-CONTACTING, AND STATIC-BED PERCOLATION FOR FINISHING 3,000 BBL. PER DAY OF MID-CONTINENT LUBRICATING OILS AND WAXES

	Thermofor continuous percolation	Hot contacting	Static-bed percolation	T.C.P. minus hot contacting
Investment:				
Clay regeneration	$300,000		$500,000	
Decolorizing and naphtha recovery	650,000	$780,000	1,980,000	
Clay inventory	1,200	14,000	35,000	
Total*	$951,200	$794,000	$2,515,000	$157,200
Operating costs, dollars per day:				
Labor	96	96	144	
Maintenance:				
Labor (3 per cent)	78	64	204	
Material (2 per cent)	52	43	136	
Labor burden (25 per cent)	44	40	88	
Fuel	110	75	165	
Clay makeup and supplies	40	720	140	
Lubricating-oil loss	252	†504	382	
Taxes and insurance (1 per cent)	26	22	69	
Total, dollars per day	698	1,564	1,328	—866
Differential earnings				866
Depreciation at 8 per cent per year				34
Taxable income				832
Federal income at 50 per cent				416
Net earnings				450
Payout, years				0.96

*In any completely new installation there would be some offsite expenditures required in addition to these totals. However, it has been assumed that these offsite expenditures would be substantially the same for the three cases considered. Furthermore, in the case of a replacement project, these offsite expenditures would obviously be very small. †Loss would be estimated at $882 for a plant with Sweetland instead of precoat filters. Total would then be $1,920 per day.

References

1. T. P. Simpson, E. S. Nicholls, and J. W. Payne, "Recent Advancements and Application of the Thermofor Kiln in the Petroleum Industry," Trans. A.I.Ch.E. 36, (6) 841 (1940).

2. H. C. Myers and R. M. Owen, "Economic Survey of Thermofor Installations in Socony-Vacuum Lubricating-Oil Refineries," The Oil and Gas Journal, 44 (13) 93-7 (1945).

Desulfurization Process Developed

In recent years the petroleum industry has had to use more and more crude petroleum with high sulfur content. This has led to sulfur in the distillates made from sulfur-containing crudes. The presence of sulfur compounds is objectionable in petroleum products because of corrosion, unpleasant odors, and its destructive influence on the effectiveness of tetraethyl lead in bringing up the octane rating of gasoline.

Recently, developments in the preparation of highly active sodium dispersions suggested a tool for use in desulfurizing petroleum distillates. These dispersions, which are readily prepared in commercially available apparatus, contain up to 60 per cent of metallic sodium in an inert hydrocarbon solvent. The National Distillers Chemical Corp., seeing an opportunity for solving the problem of sulfur contamination, engaged Battelle Memorial Institute, Columbus, Ohio, to investigate sodium dispersions as desulfurizing agents.

Battelle chemists showed by their experiments that sodium dispersions would effectively remove 96 to 100 per cent of the sulfur in petroleum distillates. Simple treatment of gasoline and kerosine blends for 5 minutes at 480° F. removed all the commonly occurring sulfur compounds, including thiophene and its homologs. Ways for filtering sludges resulting from the treatment were suggested, and the amounts of sodium to use for varying percentages of sulfur in distillates were determined.

Three-Piece Rig . . .

. . . for servicing deep wells or drilling straight through

by Roy F. Carlson
West Texas District Editor

A THREE-PIECE rig, designed for servicing deep wells or drilling all the way in shallow ones has recently been placed in service by Pioneer Well Service, Ltd., of Midland, Tex. Primary components are the substructure, a trailer unit, and the tractor unit.

Design of the unit in this manner was to afford a rig large and sturdy enough to handle deep-well servicing work and workover jobs, and afford a maximum degree of mobility at the same time. As a result both the trailer and the substructure incorporate new ideas.

Substructure

The substructure consists of two long box sections fabricated of heavy I-beams. These sections run parallel to one another for the length of the substructure, and are joined together by other steelwork that supports the derrick floor and its loads. A low ramp is built into the substructure between these two sections in the position below where the draw works would normally be.

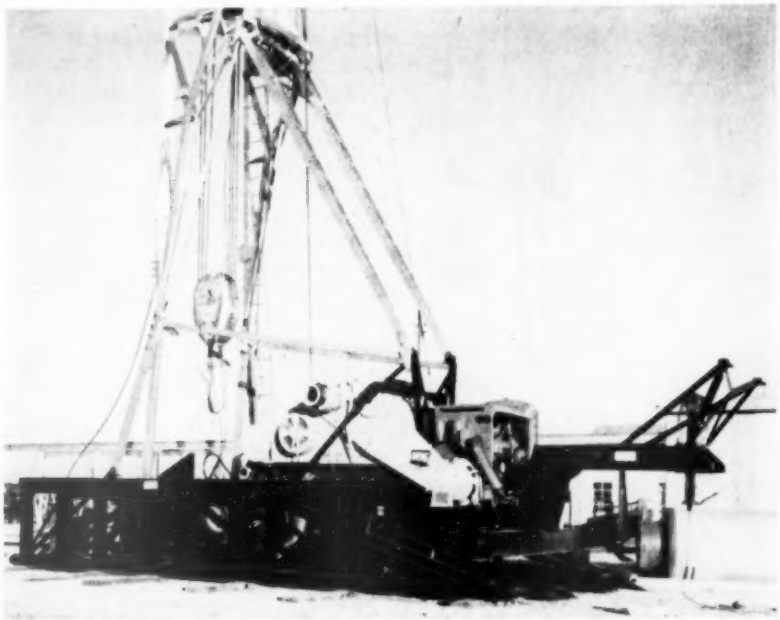
The ramp is used to raise and position the draw works, engines, and mast which are mounted on the trailer. Over-all length of the substructure is a little over 32 ft. Its height to the derrick floor is 5 ft. in one model, and 8 ft. in another model. The height of the ramp varies from 1 ft. 7 in. to 2 ft. 6 in. in two models of substructure.

Trailer Unit

Engines, draw works, and telescoping mast are mounted permanently on a tandem-wheeled trailer which is backed up on the ramp into the substructure when rigging up. The trailer is pulled by a heavy-duty tandem tractor. The tractor-trailer hitching arrangement includes a built-in jack that is used to raise and lower the end of the trailer when hooking it on or disengaging it, and for lowering the forward end of the trailer onto supporting beams in the substructure.

Over-all length of the trailer with the mast on it, in horizontal position, is just under 60 ft. The mast rests on a cradle at the forward end of the trailer and sticks out over the tractor unit so the 60 ft. represents the length of the road unit. Over-all height of the unit on the road is just over 12 ft.,

When first rigged up before beginning field work the servicing rig looked like this. Since beginning operation, the rig has drilled to nearly 5,000 ft. from the grass roots down.



The built-in jack is shown at the right end of the trailer beneath the cradle which supports the mast when laid down. The jack raises the end of the trailer so that the supporting beam may be put into place.

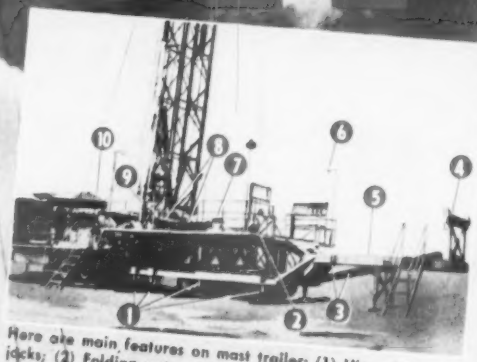
COMPLETELY PORTABLE

ABSOLUTELY NEW!

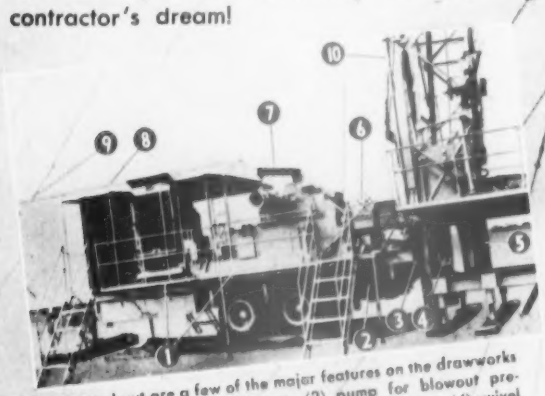
WILSON

Double-Trailer Single Engine GIANT RIG!

Yes, this is the most COMPLETE, PORTABLE RIG — to our knowledge — ever built and put on the job! Look at what has been done to make it MORE PORTABLE — MORE COMPLETE. The entire rig is compacted into 2 trailers — one trailer containing drawworks and toolhouse — the other the mast and rotary table — both of which can be driven right up to location and RIGGED UP IN 2 HOURS, or less! The entire weight of each trailer is under 65,000 pounds gross and within the 10 foot road width. For shallow drilling, it's tops! For workover, it's revolutionary! For a real money-maker, this rig is a contractor's dream!



Here are main features on mast trailer: (1) Hinged bearing jacks; (2) Folding outer sections for working floor; (3) Pipe rods, beams, and beam slots; (4) Head frame for supporting mast; (5) Walkway; (6) Light standards; (7) Fixed rotary table; (8) Stationary front hinge and pins for supporting mast; (9) Removable back pins used when raising or lowering mast; and (10) Drawworks trailer.



Pointed out are a few of the major features on the drawworks trailer: (1) folding walkways; (2) pump for blowout preventers; (3) guide key for hooking trailers together; (4) swivel for mud line; (5) removable bolster beam and center support; (6) Full view control panel; (7) pivot arm for Cathead; (8) toolhouse; (9) guy ties on toolhouse; and (10) mast trailer.

RATED CAPACITY

5,000′ with 4½″ drill pipe
6,000′ with 3½″ drill pipe

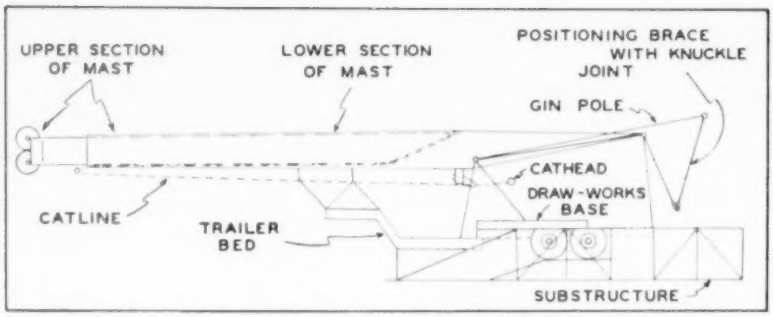
A FEW STAR FEATURES:

- ★ **DRAWWORKS — Wilson Single Engine Giant**
- ★ **Mast — Wilson 96′ Portable cable raised**
- ★ **Derrick floor working area — 20′ x 20′**
- ★ **Stationary rotary table (can be removed if need be)**
- ★ **Hinged screw jacks (Always in place)**
- ★ **Complete control of Rig by Driller at all times**
- ★ **Driller operates complete preventer system from his control panel position**
- ★ **Trailers keyed together for perfect alignment at well head or drilling site.**
- ★ **Weight buckets, tongs, and traveling block stay intact at all times during moving of rig.**

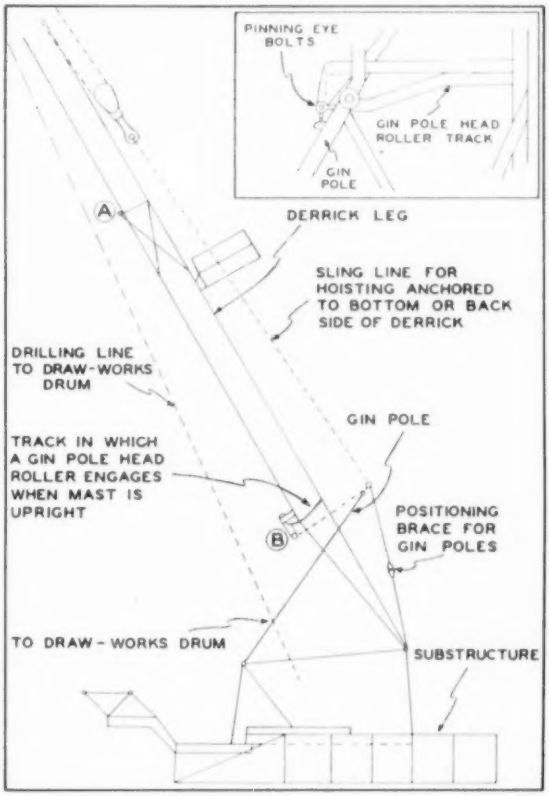
COMPARE FEATURES . . . QUALITY . . . PRICES

Wilson MANUFACTURING CO., Inc.

WICHITA FALLS, TEXAS



When the trailer has been positioned in the substructure, the mast is extended by use of the catline as shown in this sketch.


PINNING EYE BOLTS
GIN POLE HEAD ROLLER TRACK
GIN POLE
A
DERRICK LEG
SLING LINE FOR HOISTING ANCHORED TO BOTTOM OR BACK SIDE OF DERRICK
DRILLING LINE TO DRAW-WORKS DRUM
GIN POLE
TRACK IN WHICH A GIN POLE HEAD ROLLER ENGAGES WHEN MAST IS UPRIGHT
B
POSITIONING BRACE FOR GIN POLES
TO DRAW-WORKS DRUM
SUBSTRUCTURE

When fully extended, it is pinned in position at point A in sketch at right. Raising of the mast is accomplished by a sling and gin-pole arrangement and the regular hoisting equipment as shown. When fully raised the mast is held in position by the gin poles which are pinned to the back side of the mast legs at point B. Detail of point B is shown in inset.

and its width is 8 ft., approximately. Total weight of the tractor and trailer complete with mast, draw works, and engines is about 56,000 lb. Substructure can be packaged into one truck load 8 ft. wide or less.

Rigging Up

At a well location, once the site is leveled, rigging up becomes a rapid process. First, of course, the substructure and the included ramp are fitted together in the proper relationship to the well. Then the trailer is backed onto the ramp, positioned in the substructure, disengaged from the tractor, and lowered onto the supporting beams. Mast leg braces are then attached, their lower end being connected to the substructure.

The mast is raised after the trailer is positioned and detached from the tractor. It is extended before raising. When in the traveling position, the upper part of the mast is telescoped inside the bottom with the blocks and lines rigged up at all times. Extension of the mast is accomplished through use of a catline as shown in accompanying drawings.

Once the mast is extended, the upper section is locked to the bottom section with pins, and the mast is detached from its cradle support.

After the mast is extended it is raised by means of the hoisting drum line and blocks. Spooling in on the hoisting drum takes in line and causes the traveling block to move toward the crown block. This in turn causes tension in a sling line that is connected to the traveling block. This sling line is attached to the mast base, over a pair of gin-pole head sheaves.

As the sling line tightens, the gin poles rise, as shown, resulting in an angular pull from the crown to the tops of the gin poles so that the mast will rise from the cradle, and continue up to the vertical position as hoisting continues. As the mast nears vertical, rollers on the tops of the gin poles engage in tracks on the sides of the bottom section of the mast.

The mast when fully raised goes a little past vertical, the gin pole rollers following the tracks, and then settles back into a steady position with the rollers in the upward turned end of the track as illustrated. Eye-bolts further secure the mast in the vertical position. No guy lines are needed with the mast.

Lowering the mast is the reverse procedure to that for raising. However, a line must be used to jack the mast off the gin poles past vertical and start it down. When lowered the upper section is pulled into the lower section by the block and hook.

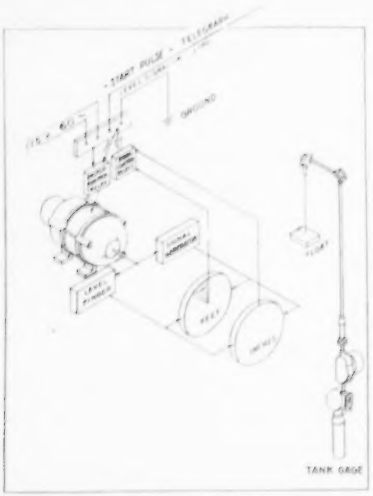
Over-all height of the mast from derrick floor to the base of the crown is 94 ft. Nearly 8 ft. of space is available between the mast legs at the derrick floor. Pipe-racking fingers are installed on either side of the monkey board in the mast. Space is available for racking 5,400 ft. of 4½-in. drill pipe. In a recent rigup the trailer was backed into the substructure and the mast extended and raised in a period of 45 minutes.

Spark-Ignition Reactions Studied

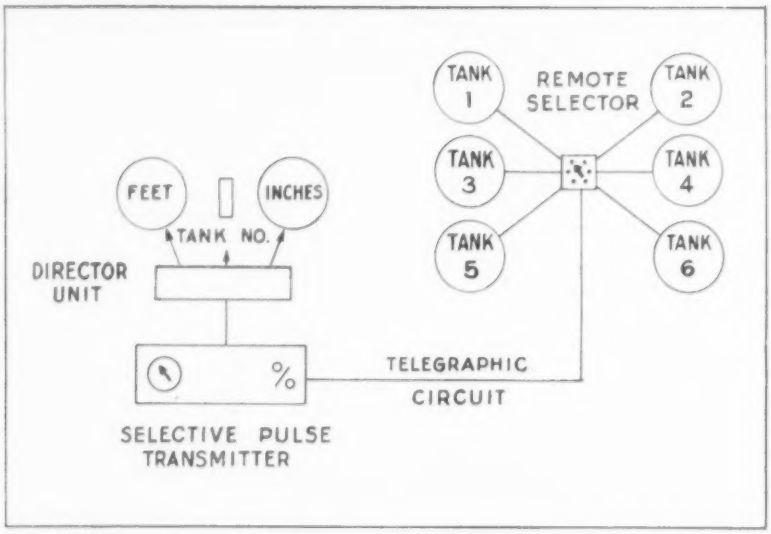
Knowledge of what happens inside the combustion chambers of engines prior to and following ignition of the explosive mixture is the key to improvements in engines and fuels. Chemists, physicists, and combustion engineers of Battelle Memorial Institute, Columbus, Ohio, have given much attention to the uncovering of such knowledge.

In one 3-year study, sponsored by the E. I. du Pont de Nemours & Co., Battelle scientists studied reactions in hydrocarbon-air mixtures prior to ignition. The immediate objective was information on the relationship between hydrocarbon structure in motor fuels and engine performance; the ultimate objective was more efficient utilization of motor fuels.

Much of this study was concerned with the vapor-phase oxidation of hexanes. The preliminary oxidation products formed at various temperatures from 275° to 400° C. were subjected to vacuum distillation, catalytic hydrogenation, infrared analysis, and liquid-liquid distribution studies to determine their chemical natures.



FUNCTIONAL drawing of standard level gage interconnected to elements of tank transmitter.



FOR GAGING at a point remote from the tank site where it would be uneconomic to provide multiple electrical conductors between each tank and remote gaging-station receiver, Varioplex is arranged as above.

Measuring liquid content of tanks by remote control

ATTENTION, you tank gagers: Don't be surprised if the boss calls you in one of these days and gives you other "chores" to do around the tank farm besides gaging tanks, because that particular task is going "modern."

The reason: A new system has been developed which enables a company to gage any of its tanks at any location by remote control, and the job can be done in 25 seconds for each tank!

Shand & Jurs Co., Berkeley, Calif., has developed what it calls "The Varioplex System of Remote Level Gaging—A System for the Remote Telegraphic Determination of Fluid Levels."

How it works . . . Suppose a company with control offices in New York City wants to gage every tank on a tank farm, say down in Baton Rouge. "Varioplex" is put into operation. Distance means nothing to Varioplex, because it utilizes the same telegraphic leased wires which the company uses for telephones, teletypewriters, etc.

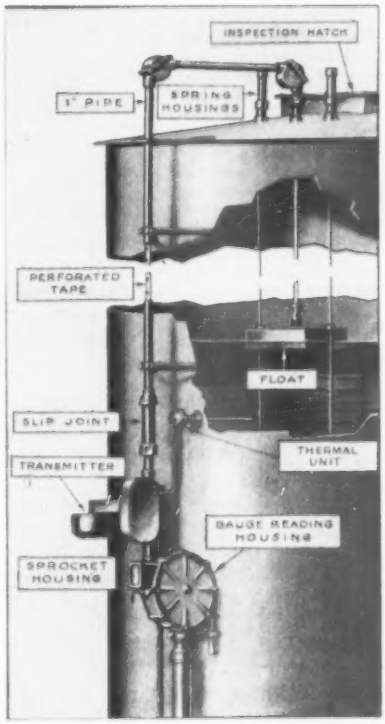
When a tank is gaged in the Varioplex method, the tank "identifies itself" to confirm that there is no error (in gaging the wrong tank). The "gager" notes on dials the total number of feet and inches of liquid in the tank.

Components . . . In its simplest form, Varioplex may be used for remote simultaneous reading of feet and inches (or fractional inches) of content in a single storage tank or container. This system, when thus used, consists of a tank transmitter installed at the tank and connected to a receiver and control panel at a remote gaging station by two electrical conductors. One conductor is hooked to the foot-indicating dial; the other to the inch indicator.

Signaling-element control devices within the tank transmitter are positioned by the tank-gaging apparatus, their respective positions at all times corresponding to exact level of content inside the tank.

When the control key at the remote gaging station is operated by the gager the intelligence placed in the tank transmitter by the float-gaging mechanism is automatically converted into telegraphic impulses which cause the pointer of the receiver to assume a position which corresponds to the exact positioning of the signaling-control elements within the transmitter. In this way, the identical depth reading which appears at the visual tank gage will be shown at the remote gaging station.

Remote station selectors of the Varioplex apparatus can be installed at the junction of the local field tank lines. This same selector is interconnected to the remote gaging station by means of a single telegraphic circuit.



CUTAWAY view showing components attached to tank.

How sharp engineering dulled the cut of abrasive mud

Abrasive drilling mud is a bane as well as a boon to the industry. It has destroyed countless thousands of conventional valves in mud line service, yet it is an essential aid to drilling.

In 1938, Cameron engineers, with long experience in resilient pack-offs and seals for blowout preventers and master valves, tackled the mud line valve problem. The result was the Flex-Seal Valve with renewable flow-way insert to absorb the cutting action. The rest is history. When rig operators learned that they could drill four to five times as much footage with Flex-Seal Valves and then repair them at the rig at small cost by simply replacing the rubber flow-way insert . . . that did it! A blow to the valve repair business, perhaps, but a blessing to the operators.

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Where precision craftsmanship is required in tough-to-handle metals, you may rely on Graver. Nearly a century of experience in building tanks, combined with resourceful creative engineering, helps to explain the continuous flow of Graver vessels to the process and petroleum industries.

This is especially true in the fabrication of towers and vessels of alloys and aluminum. Here Graver's rigid quality control, sound welding research, and ability to work to close tolerances result in highest quality products. For *really difficult jobs,* look to Graver!

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PROCESS VESSELS

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CATASAUQUA, PA. • SAND SPRINGS, OKLA. • CASPER, WYO.

ONE OF SIX motorboats of Tide Water Associated Oil Co.'s drilling-production fleet which is equipped with combustible gas alarms to monitor concentrations of vapor and gases below deck. These boats operate in the Venice field area of Louisiana.

Boats for drilling personnel fitted with warning devices as a guard against explosions

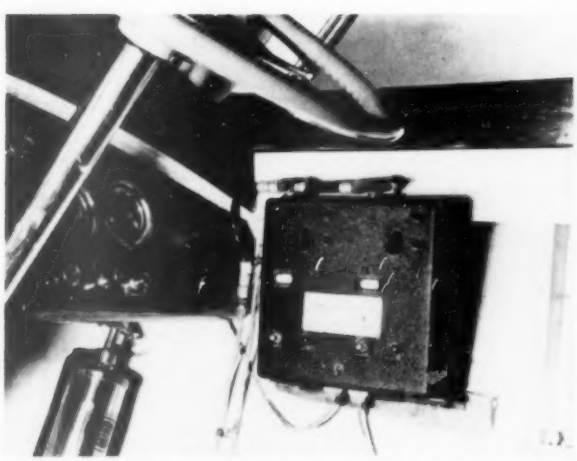
TO guard against possible gasoline-vapor explosions aboard-ship, Tide Water Associated Oil Co. has equipped each of its six boats operating along a 7-mile canal in the Venice field area of Louisiana with automatic warning devices.

How alarm works . . . Developed by Mine Safety Appliances Co., Pittsburgh, each alarm is a compact instrument which has been especially designed for rugged conditions. It continuously samples air from two locations on the boat. These locations are the engine and fuel compartments, where gasoline-vapor concentrations are most likely to occur from leaks in tanks or fuel lines.

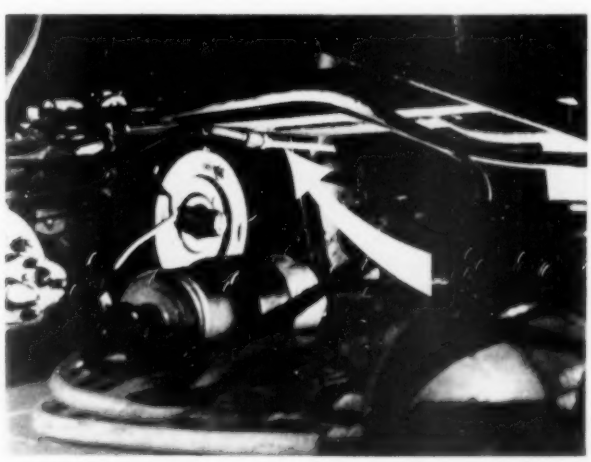
Air samples are drawn to the instrument through ¼-in. tinned-copper tubes by a centrifugal pump integral with the alarm equipment. Within the alarm instrument are two cells for each sampling line. Each cell contains a heated platinum filament. One cell, the compensator, contains uncontaminated air; the other, the detector, receives the air sample.

Balanced circuit . . . The two filaments form a balanced electrical circuit, and any combustible gas or vapor in an air sample is burned on contact with the detector filament. This increases temperature of the wire and its electrical resistance. When resistance is increased, the circuit is unbalanced in direct proportion to the percentage of combustible vapor in the sample.

When the vapor concentration reaches 25 per cent of the lower explosive limit, an alarm circuit is energized. This lights a red warning signal on the panel and actuates a horn.



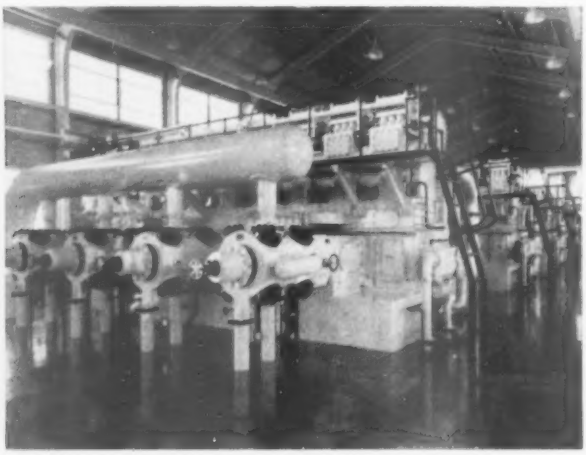
ALARM CASE is mounted adjacent to steering wheel. It continuously samples and analyzes air from two locations aboard the boat. If vapor concentration reaches 25 per cent of lower explosive limit, red warning light goes on, and horn is actuated.



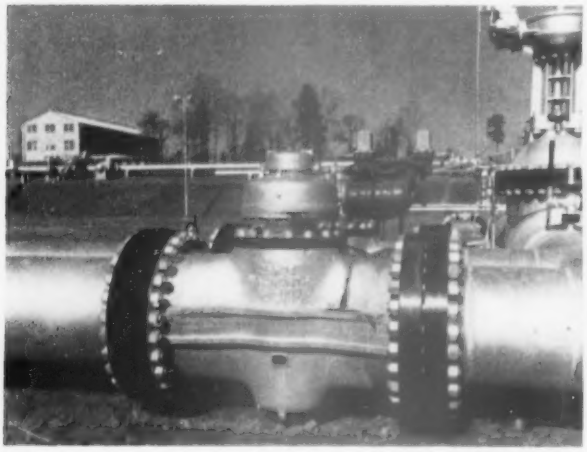
ONE OF THE TWO sampling locations is in the engine compartment. Air is drawn from here through ¼-in. tinned-copper tubing to the analyzer in the instrument case. The sensitive detection instrument, in cabin, is not affected by bilge water.

LET'S TAKE A TOUR . . .

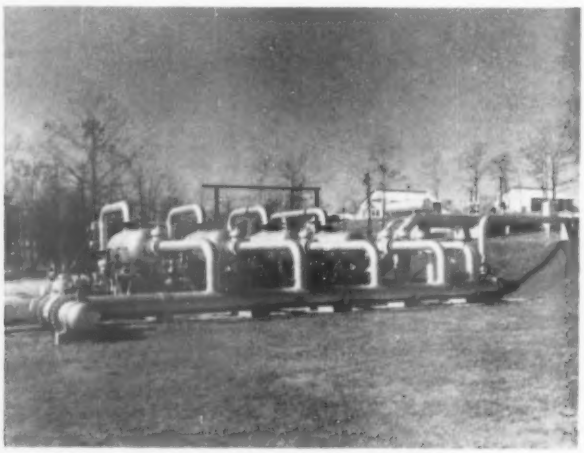
1 A general view of United Gas' McComb, Miss., station, showing 30 and 24-in. lines entering the station area. Meter house is at left; also shown are scrubbers, compressor building.



2 McComb station has five UTC-168 Worthington engine-compressors, each rated at 1,600 hp. at 320 r.p.m. The eight vertical power cylinders drive four horizontal compressor cylinders.



3 This big valve on the 24-in. suction line at the McComb compressor station of United Gas Pipe Line Co. in Mississippi would be closed automatically in event of a line break.



4 All natural gas entering the station passes through these big scrubbers. One feature of the McComb station is that flow on a 24-in. line to Baxterville can be reversed.

United Gas' Newest Compressor Plant

McComb, Miss., station first of eight to go in service

EVER been in and around a huge gas-compressor station? Then let's take a "guided tour," via the camera man, of the first new station to go into service in United Gas Pipe Line Co.'s 3-year, $250,000,000 expansion program.

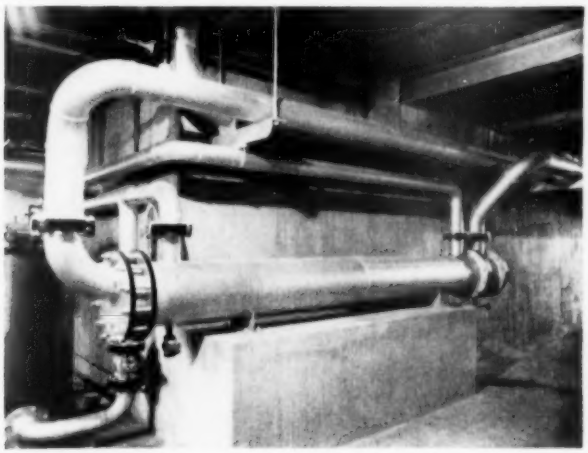
This modern plant is at McComb, Miss., where five 1,600-hp. natural-gas engine-compressors are in operation handling 390,000,000 cu. ft., of natural gas per day.

The total expansion program, which is to be completed this year, includes eight compressor stations and 1,735 miles of new pipe lines. The expansion will make the system capable of delivering more than 4 billion cubic feet of gas per day, with improved flexibility of operation and development of new natural-gas reserves.

This modern station is one of the key installations on a new 30-in. line which carries gas from Louisiana fields and from underwater wells in the Gulf of Mexico, north to Jackson and Kosciusko, Miss. McComb also serves as the terminus of a 24-in. line from Baxterville field, 41 miles southeast, and can either take gas from the field for delivery north, or reverse the flow and pump gas through the Baxterville line to towns in Mississippi to Mobile, Ala., and Pensacola, Fla.

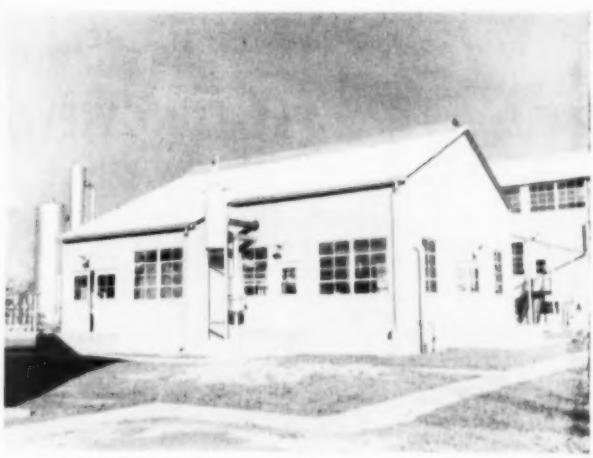
The compressor station at McComb, and the others now building, were designed by United Gas engineers to meet three basic requisites: efficiency, reliability, and safety.

5 Lubricating oil for each engine is cleaned continuously by a pair of filters. The full-flow filter has 18 cellulose cartridges; the partial flow filter has eight fuller's-earth cartridges.

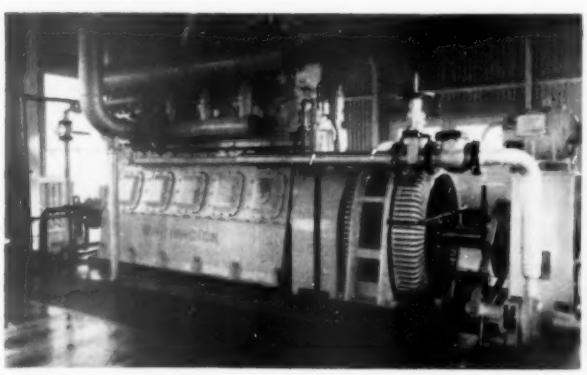


6 All lubricating oil used on the big Worthington engine-compressors is circulated through an oil cooler. When necessary, it is transferred to a tank in the auxiliary building and filtered.

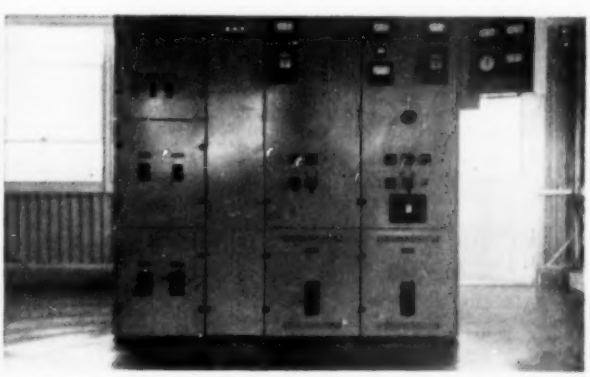
7 Cooling water for the five engines is circulated through four dry-air coolers by centrifugal pumps. Three motor-driven centrifugals circulate water to cool the engine lube oil.



8 Adjoining the compressor building at McComb is this auxiliary house. This building contains engine-generator set and lube-purification equipment. Engine lube oil is filtered here.



9 Electrical requirements are met by this natural-gas engine which develops 445 hp. at 514 r.p.m. Also shown are generator, belted jacket water pump, and lube filter.



10 The switchboard in the auxiliary house, showing switchgear and instruments. The station is self-sufficient, supplying safety-system solenoids and other emergency requirements.

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Hydrogen Attack on Steel

(Continued from page 103)

In systems where appreciable quantities of hydrogen sulfide are always present, a virtually unlimited source of reactive hydrogen is available. However, most inorganic and some organic acids may also serve as a source of reactive hydrogen for the corrosion reaction.

A liquid-water phase is necessary for the corrosion reaction to proceed. This agrees with the findings that hydrogen blistering and fissuring occur much more frequently in areas of absorbers adjacent to intercooler returns, condenser shells, and accumulators than in other types of equipment. Further, the lower temperatures which prevail during the winter would be expected to increase the amount of moisture which condenses from the hydrocarbon streams. Plant experience has indicated that hydrogen attack is aggravated during the winter months.

Promoting factors . . . Three conditions which promote hydrogen penetration in the presence of hydrogen sulfide are:

1. Low pH.
2. High pH, under anaerobic conditions.
3. High pH in a system which contains cyanide.

High penetration rates are observed in low-pH systems

The penetration rate decreases as the pH is increased. A minimum penetration rate occurs at a pH of approximately 7.5.

Possible Control Methods

Hydrogen attack can be prevented by altering any one of the six general requirements for blistering which were discussed above. It is impractical to change some of these conditions, but others have been studied and, wherever feasible, plant trials have been made.

Altering corroding surface . . . The vessel surface may be successfully protected from the attack of the corrosive agents by the installation of expendable steel liners or by coating the interior walls of the vessel with ganister (1 part lumnite cement, 2 parts fine fire clay, 1 part coarse fire clay).

Elimination of source . . . Elimination of compounds which contain reactive hydrogen prior to compression is not practical when such large quantities of gases as are ordinarily processed by the Wood River refinery are handled. All hydrogen sulfide and other acid gases would require removal from the processing stream.

Approximately 50 tons of hydrogen sulfide per day is produced with the catalytically cracked gases. This would

require 84,000 gal. of 20° Bé. caustic soda solution per day, assuming 100 per cent utilization of the caustic.

A regenerative process for the removal of hydrogen sulfide and for the recovery of the sulfur would require a separate gas-treating plant.

Elimination of water . . . There is ample evidence in the literature that complete drying of the process stream would eliminate corrosion and hydrogen penetration.[5,8] If the gas streams are dried, it is likely that salts such as ammonium carbonate may be deposited in fractionating columns and result in plugging. Provisions for both washing and drying would require excessive equipment. Further, the complexity of the gas-recovery plant-feed system is such that several such washing and drying facilities would be required.

Elimination of poisoning agents . . . Removal of agents which poison the steel surface and retard the formation of molecular hydrogen is another method for stopping hydrogen penetration. Only a trace of these agents is required as a catalyst poison; and, once the steel surface is poisoned, the removal of these agents is difficult. Acid cleaning only partly removes the catalyst poison. Sulfide ion is an efficient catalyst poison, and its complete elimination from the system would require the removal of all of the hydrogen sulfide —and this has already been shown to be impractical.

Effect of cleaner steels . . . Cleaner steels (such as A.S.T.M. A 201, Grade B) were suggested. In general, clean steels are as subject to fissuring as are so-called "dirty" steels in which blisters provide a warning of impending failure. In steels which blister most severely, the distribution rather than the total amount of slag determines the blistering characteristics.

Organic inhibitors . . . Organic corrosion inhibitors have been tested both in laboratory and plant applications with little success. In laboratory work a number of proprietary inhibitors were tested for their effectiveness in the prevention of hydrogen penetration. Such inhibitors, when they were used in the recommended concentrations, or even in many times the feasible concentrations, failed to protect test coupons against blistering for significant periods of time.

Use of polysulfide . . . It was observed in laboratory experiments that high hydrogen penetration rates through steel could be maintained in basic systems under anaerobic conditions. Whenever polysulfide was added to ammonium hydrosulfide solution, or when traces of oxygen were allowed to react with the solution to form polysulfide, corrosion and hydrogen-penetration rates immediately dropped to practically zero. Further experiments showed that cyanide ion reacts with polysulfide to form thiocyanate, and that the hydrogen-penetration rate, consequently, returns to its former value.

This led to the hypothesis that the occurrence of hydrogen blistering in the plant resulted entirely from the relative concentrations of cyanide, and of polysulfide and oxygen, in the process stream. Laboratory experiments to prove this hypothesis, as well as plant experiments utilizing both polysulfide and oxygen to control hydrogen penetration, have been completely successful.

Addition of polysulfide in acid solution is ineffective for the prevention of hydrogen penetration, presumably because the polysulfide is decomposed into hydrogen sulfide and free sulfur. In this case hydrogen penetration can be controlled by neutralizing the stream with ammonia and by injecting oxygen as required.

A system in which hydrogen-penetration conditions exist can be deactivated by the addition of a small amount of ammonium polysulfide or some material which forms polysulfide in the system. In laboratory work oxygen, ferric salts, sulfites, and polysulfides have been used with equal effectiveness as deactivators to stop hydrogen penetration in alkaline solution. On the other hand, cyanide and ferrous sulfate are effective activators. Cyanide reacts stoichiometrically with polysulfide to give thiocyanate. Ferrous sulfide, which forms on addition of ferrous sulfate to ammonium hydrosulfide solution, removes polysulfide less efficiently. Deactivators other than polysulfide are inhibitors presumably because they react in ammonium hydrosulfide solution to produce polysulfide.

Depletion from solution of polysulfide by its reaction with ferrous sulfide is not stoichiometric. On the other hand, reaction between polysulfide and cyanide is stoichiometric.

Although ferrous sulfide activates by way of the removal of polysulfide from solution and consequent desorption from the surface of the iron, cyanide activates by this mechanism and also by the removal through dissolution of the protective complex iron-sulfide-polysulfide layer. Thus cyanide is a very effective activator for hydrogen penetration and, hence, cyanide is of greater consequence in plant operation than ferrous sulfide.

In order to protect against hydrogen penetration in a system in which cyanide is present, sufficient polysulfide must be added to fulfill the following four requirements:

1. All cyanide must be converted to thiocyanate.

2. The ferrous sulfide present in the system must be saturated to form the ferrous-sulfide-polysulfide complex.

3. The steel surface must be covered with an absorbed layer of polysulfide.

4. A slight excess of polysulfide in solution must be maintained so that the protective film (item 3) is never depleted.

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Answer to "Check Chart"

The equipment shown on page 91 is correctly identified as being a new natural-gas treater-filter hookup on a rotary drilling rig of Helmerich & Payne, Inc., Tulsa, on operating location in Denton Devonian field, Lea County, New Mexico.

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COMPRESSOR CALCULATIONS—7

How to Estimate Horsepower Needs

. . . to compress a given quantity of gas

QUICK estimation of the horsepower required to compress a predetermined quantity of gas under given conditions of suction and discharge pressure is simplified by the use of sizing charts such as the one shown in Fig. 1. Conversely, the quantity of gas which a particular compressor unit can handle under specified pressure conditions also can be computed readily.

Sizing Horsepower Needs

Problem: Calculate the actual capacity of a compressor needed to compress 2,000 M.c.f. of natural gas per day (measured at 14.4 psia. and suction temperature of 100° F.) from a suction pressure of 40 psig. to a discharge pressure of 600 psig. The natural gas is dry. Ratio of specific heats (N) is 1.275.

Solution: Step 1.—Calculate brake horsepower needs.

Using Fig. 1, draw a vertical line from the 600-psig. discharge pressure point on the abscissa so as to intersect the 40-psig. suction pressure parameter. From this point of intersection, draw a horizontal line to the left so as to intersect the ordinate; the answer to this step is 162 b.hp. per M.M.c.f. per day (measured at 14.4 psia. and 100° F.).

Step 2.—Calculate brake horsepower needs in terms of total gas volume compressed.

Since the gas volume compressed is 2,000 M.c.f. per day, the required horsepower will be obtained by multiplying the brake horsepower per million cubic feet by the number of million cubic feet of gas handled, or:

$$162 \times 2 = 324 \text{ b.hp.}$$

Step 3.—Select the next largest compressor available to handle these requirements.

Reference to manufacturer's bulletin gave two-stage 350 b.hp., as the next highest compressor size available.

Step 4.—Calculate actual capacity of the compressor selected to do this particular job.

Divide rated brake horsepower of compressor by the brake horsepower requirements per million cubic feet of gas compressed, or:

$$\frac{350}{162} = 2.16$$

Thus the **actual** capacity of the compressor selected is 2,160 M.c.f. per day (measured at 14.4 psia. and a suction temperature of 100° F.).

A comparison of **actual** vs. **required** capacities may be made simply by dividing the actual capacity of the compressor by the gas volume originally described in the problem, or:

$$\frac{2,160}{2,000} = 108$$

Thus the capacity of the compressor selected is 8 per cent greater than required.

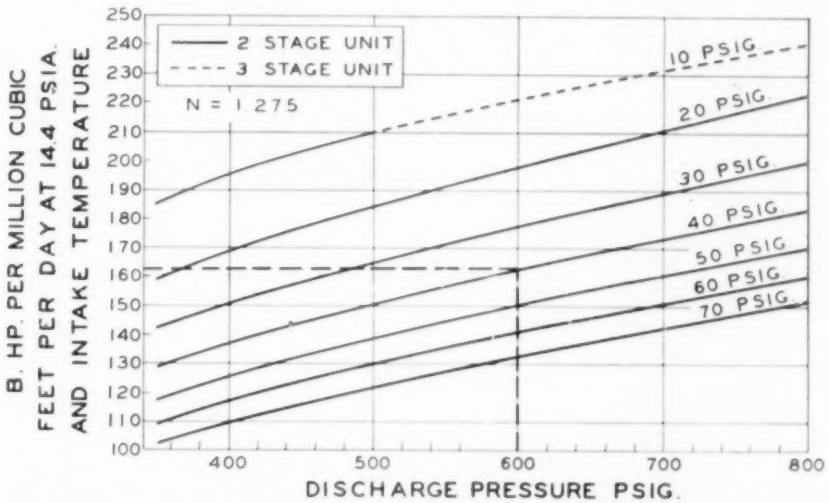

Fig. 1—Brake horsepower required to compress a million cubic feet of gas under given suction and discharge pressure conditions can be read directly from this chart. (Chart courtesy Clark Bros. Co., Olean, N. Y.)

EASIEST MAINTENANCE EVER. new LIGHTNIN Model SE is easier to keep in operation than any other side entering mixer. Here's why:

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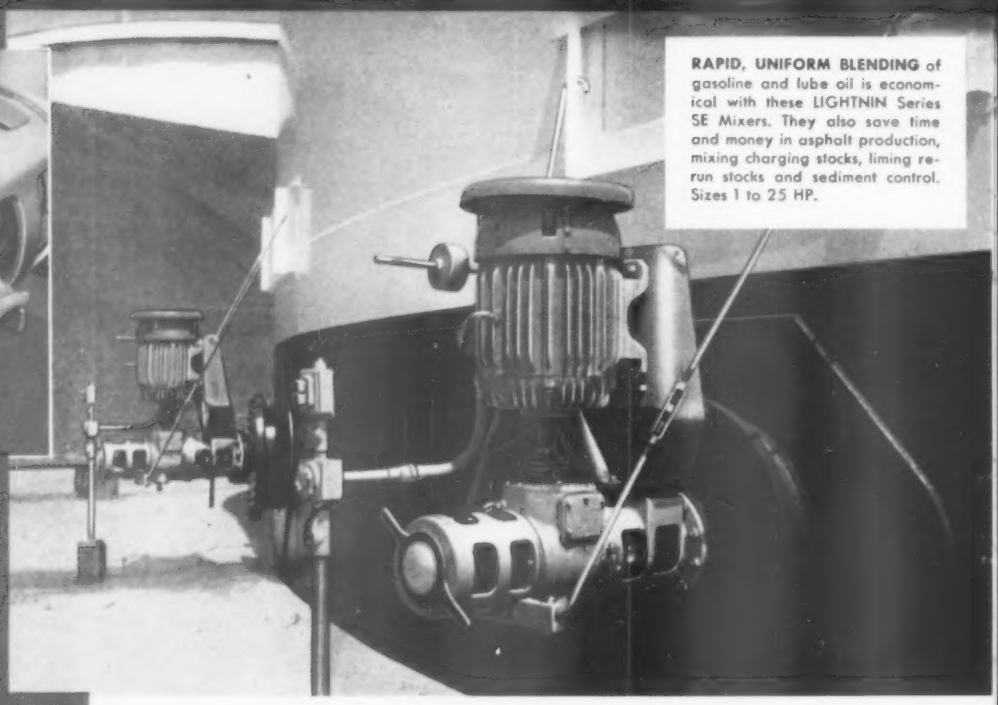
2. **Choice of stuffing boxes** for maintenance-free mechanical seals to suit your conditions.



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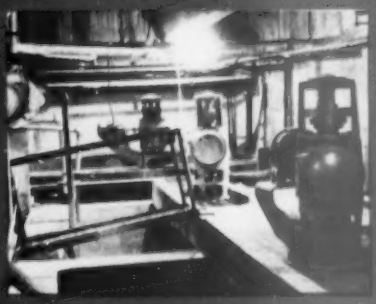

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Yet, this is only one of the applications which can be performed better and faster with these mixers. For example, you can slash hours off gasoline blending and ethylizing time; cut back asphalt in ⅛ the time required by recirculation; uniformly mix charging stocks.

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PETROLEUM PRODUCTS

Product Development Trends

by Dr. W. E. Kuhn*

THE petroleum industry has continually improved its yield of gasoline per barrel of crude and the quality of this gasoline. This has been done, however, at the expense of the middle distillates which will not be as readily available in an emergency. They will be used for other products. Manufacturing operations will be different. They will be geared to produce more raw material for synthetic rubber, for aviation gasoline, and to make increased amounts of jet fuel, diesel fuel, and Navy fuel. Motor gasoline must suffer. It is essential that the military be sure that it can operate its motorized equipment on a gasoline of the quality that will be available in an emergency.

With the advent of the use of turbojet engines commercially, there may be some noteworthy developments. The use of additives to improve certain performance characteristics of these fuels is receiving attention.

Distillate fuel . . . Since World War II the number of home oil burners in the United States has increased from 2,517,000 to 6,344,000 which represents a substantial increase in the demand for distillate fuel oil. To meet this demand, it has been necessary to use cracked stocks. Commercially these stocks are being used successfully in diesel engines. Through both improvements in manufacture and by the use of additives, original objections to the use of some cracked components have been either eliminated or minimized. Improvement in cetane rating, reduction in screen clogging, elimination of injector-nozzle sticking, and improved stability in storage have resulted. This should permit the Navy to consider changing MIL-F-16884 (Ships) which states Navy diesel fuel shall contain no cracked material. In an all-out emergency, the Navy may not be able to obtain this "composition specification." Therefore, it is timely to consider the use of test methods to protect against the undesirable characteristics that may be thought to accompany all cracked fuels.

Fuel-oil pumpability . . . The Navy demands for fuel oil are great. It is most unlikely that they will obtain this supply from domestic sources alone. Because of the characteristics of certain fuel oils, not necessarily confined to foreign crudes, there is a definite need of recognizing pumpability properties. The general use of pumps with definite and positive shearing stress justifies an immediate reconsideration of the restrictive pour test limitations of MIL-F-859A as concerns both the special and heavy grades of Navy fuel oil. The Navy is giving the subject of a pumpability test consideration; however, it is urged that it be given a higher priority.

In addition to providing a greater source of supply of fuel oils, the use of a pumpability specification, reflecting the adoption of improved handling equipment, may permit a higher-viscosity Navy Special Fuel Oil. This would release cutter stocks that will be needed in diesel fuel, jet fuel, and domestic heating fuel.

Lubricating oil . . . The use of additives in aircraft engine oil has not been generally adopted. Additive aircraft engine oils, however, have been proved airworthy and of value in certain types of aircraft engines. Expanding use of products of this type can be expected.

The increasing use of automatic transmissions may require that automatic transmission fluids becomes a standard item of military supply. The use of lubricants specially designed to increase performance characteristics and useful life of these expensive transmissions is important. Advantage might be taken in some equipment of the fact that these products, even in diluted form, give excellent internal-combustion-engine lubrication.

The Navy, for a long time, has given attention to additive-type turbine oils. The higher pressures in turbine reduction gears are resulting in consideration of e.p. agents in Navy turbine oils. Caution is urged. Divorcing the turbine oil and gear oil would certainly simplify the problem. The use of a common system and requiring a combination of properties incorporated in the oil may result in a product that, at its best, is only a good compromise. Extreme care must be taken to assure that the various additives used in a given oil or in two different oils of this type are not antagonistic.

Grease developments . . . Some lithium greases will subscribe to many of the requirements as to wide operating temperature, unusual conditions, space limitation, and high-output performance. Some shear-resistant anhydrous calcium greases are proving exceptionally good. Tolerance for large amounts of water without losing grease structure in use has been possible in these products.

New developments in grease technology include the incorporation of inorganic fillers, the use of synthetic esters, and of inorganic gels. The copper phthalocyanine sodium soap greases, the silicone-oil grease, and the many possibilities known today in the use of synthetic esters in grease have provided a stepping stone toward a better grease.

Emphasis today in the development of new greases include shear resistance, long-time high-temperature performance, rust resistance, oxidation resistance, wide temperature performance, adequate water tolerance, and above all adequate structure stability in service while providing lubrication.

* Manager of technical and research division, The Texas Co. From talk given before the Navy Cooperative Committee.

THE RECORDS IN THE CHART BELOW come directly from the files of the operators in Kettleman Hills North Dome Field. This is not a one, or a few, well comparison—here is finally a large number analysis with the inherent accuracy of large numbers! Of the wells studied, 79 were completed with oil base drilling fluid, 68 with water base muds, 7 with emulsion muds, and 4 with crude oil—over an 8-year span (April 8, 1943, thru May 31, 1951). These wells were all drilled in the conventional manner with one exception—the completion muds used.

There are two zones: The Vaqueros, a single sand body, and The Temblor which consists of 5 producing intervals. For accuracy they have been studied separately. Using $2.70, the average value per bbl. of Kettleman Hills crude, the Black Magic completions in the Vaqueros zone actually produced $1,455,178 more oil than the water base completions for an equivalent number of well-days production. In The Temblor, the Black Magic wells returned $4,111,379 more than the water base wells on a similar calculation, for an over-all advantage of $5,566,557 in favor of the wells drilled with Black Magic.

5½ MILLION DOLLARS more production *from wells completed with* BLACK MAGIC

OIL BASE DRILLING FLUID

in Kettleman Hills North Dome Field

Type of Mud	No. of Wells	Average T.D.	Average Producing Zone Thickness	Cumulative Production to date (bbls)	Time on Production to date (days)	Average Production (bbls per well-day)
VAQUEROS ZONE						
BLACK MAGIC	29	8764′	67′	6,163,520	47,036	131.04
Water Base	22	8741′	69′	4,536,448	37,937	119.58
Emulsion	2	9029′	59′	175,437	1,631	107.56
TEMBLOR ZONE						
BLACK MAGIC	50	8292′	76′	10,550,827	66,427	158.83
Water Base	46	8267′	110′	10,227,359	75,252	135.91
Emulsion	5	8450′	106′	480,099	4,072	117.90
Crude Oil	4	8200′	48′	226,066	1,819	124.28

The total cost of the mud for the Black Magic Wells was $258,310, including all additives and freight charges. Much of this mud is still in use or in storage for future use because, unlike water base muds, Black Magic can be used over and over again. So, the net cost is considerably under $258,310. But, even figured at the original cost, the Black Magic amounts to less than 0.6 of *one percent* of the total value of oil recovered from the Black Magic wells to date, and only about 5% of the value of the *additional* oil recovered. *What cheaper insurance can you buy to assure the greatest dollar return for the money invested in drilling a well?* For the complete production history of these wells, write for a copy of "The Kettleman Hills Story."

OB PRODUCTS

Black Magic	White Magic
OB Gen	Chemical "V"
OB Gel	Chemical "X"
OB Zero	Chemical "W"
OB Wate	OB Mix Fix
Econo Magic	OB Heavywate
Voodoo Dust	Pepto Magic
OB Well Wash	Special Additive 58
OB Mud Guns	Test Equipment
No-Glo	Hand Cleaner
No-Glo Oil	OB Formaseal
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Use and Care of Wire Rope—11*

. . . How to Splice

ROPES are spliced endless, or have thimbles or loops spliced into the ends, to better perform the various kinds of work allotted to them. Worn sections may be replaced by "splicing in" a new length. Different kinds of work require different types of splices, several of which are here described in detail.

A few general remarks in addition to the specific directions may be of assistance to those who have to make splices in the field.

It is very important that the strands be laid in place firmly, and the same degree of tightness should be secured in all strands, as far as possible. If some strands are loose, resulting in an unbalanced condition, all strands will not handle their proportion of the load. The loose strands will be higher than the others, and will be subjected to excessive abrasion. The tight strands will carry more than their proportion of the load, and this unequal distribution will not produce a splice of full strength.

Splices in the field are usually made by men more or less skilled in this operation. Experienced men should make all important splices, and particular care should be used, where a failure might endanger the lives of workmen.

The splicing of shaft ropes is not recommended, nor ropes on inclines steeper than 45°. It is not the best practice to splice a long-lay rope into a regular-lay rope, as the tucks will not fit together properly. Neither is it good practice to splice a preformed rope into a nonpreformed rope; nor to splice together ropes that have been used on different jobs under different operating conditions.

Loop or thimble splices . . . The thimble splice is used for splicing the thimbles, or for forming a loop or eye in the end of a rope. There are many variations of this splice, some of which are designed for special services. The splices described here have been found by test to develop higher efficiencies than some variations.

Running or endless splices . . . Standard running splices in six-strand ropes are for joining ropes together or making a rope endless. A fairly short running splice may be used for all ordinary purposes, but a longer running splice should be used on slopes and haulage ways. An even greater length is recommended for splicing flattened strand and long-lay round-strand ropes. Tramway traction ropes require extra long splices.

When making a running splice to join two lengths of rope, the total length of the finished splice is equal to the combined length of the unlaid strands. This is also the measure of the "extra length" required to make the splice.

The length of a short running splice is usually about 24 to 40 times the diameter of the rope. The length of a long running splice is usually about 60 to 80 times the diameter. Lengths of tucks in ropes with fiber cores are usually figured at about one-sixteenth the length of the total splice, so that an appreciable amount of core will be left in the rope. When splicing a rope with a wire-rope core the entire core would be removed for the length of the splice, and the tucks will meet inside the rope, which would make them about one-twelfth of the total length of the splice.

Tied running splices . . . These splices, sometimes called Nash or Chicago splices, are always used when splicing eight-strand ropes. They are also employed occasionally on six-strand ropes when operating conditions lead to early deterioration of the standard running splice.

TABLE OF LENGTHS FOR STANDARD RUNNING SPLICE—SIX-STRAND ROPES

REGULAR-LAY ROPES

Rope diameter in inches	For all ordinary purposes: Length of splice in feet	Distance to unlay in feet	Length in tuck in inches	For haulages and inclines: Length of splice in feet	Distance to unlay in feet	Length of tuck in inches
¼	16	8	12	30	15	15
⅜	16	8	12	30	15	15
½	20	10	16	40	20	20
⅝	20	10	16	40	20	20
¾	24	12	20	50	25	25
⅞	25	12	20	50	25	25
1	28	14	24	60	30	30
1⅛	28	15	25	60	30	30
1¼	32	16	28	70	35	35
1⅜	32	16	28	70	35	35
1½	36	18	32	80	40	40

For special purposes, such as power drives, amusement devices, etc., length of splice should equal length of shorter splice shown above, plus 50 per cent.

LONG-LAY ROPES

Rope diameter in inches	Flattened strand and round strand: Length of splice in feet	Distance to unlay in feet	Length in tuck in inches	Tramway traction ropes: Length of splice in feet	Distance to unlay in feet	Length of tuck in inches
¼	36	18	18			
⅜	36	18	18			
½	48	24	24	54	27	27
⅝	48	24	24	62	31	31
¾	60	30	30	70	35	35
⅞	66	33	33	78	39	39
1	72	36	36	86	43	43
1⅛	78	38	38			
1¼	84	42	42			
1⅜	90	45	45			
1½	96	48	48			

TABLE OF LENGTHS OF TIED RUNNING SPLICE (NASH OR CHICAGO SPLICE)

Rope diameter in inches—	6 x 19: Length of splice in feet	6 x 19: Distance to unlay in feet	8 x 19: Length of splice in feet	8 x 19: Distance to unlay in feet
¼ to ½, incl.	20	10	24	12
⅝ and ¾	24	12	28	14
⅞ and 1	28	14	28	14

*Taken from Bulletin 61, Use and Care of Wire Rope, A. Leschen & Sons Rope Co.

"I could see the corpsman kneeling over me. The blood plasma was running down through a tube into my arm and he said everything was going to be O.K. I was walking across an enemy mine field in Seoul when one exploded and a piece of shrapnel caught me in the leg.

"'Got enough of that stuff?' I asked him, pointing to the blood. 'I guess we never have enough,' he said, 'but you can thank *somebody* for this pint.'

"How do you thank 'somebody' for blood? For saving your life? When I got back home, I discovered the answer at my local blood donor center. There's only *one* way to say thanks—by giving some of your own blood."

"How do you thank 'somebody' for Blood?"

Yes, all kinds of people give blood—for all kinds of reasons. But whatever *your* reason for giving blood, this you can be sure of: Whether your blood goes to a combat area, a local hospital, or for Civil Defense needs—this priceless, painless gift will some day save an American life!

Business Executives!
✓Check These Questions!

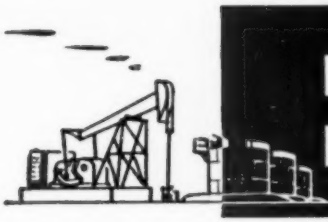
If you can answer "yes" to most of them, you—and your company—are doing a needed job for the National Blood Program.

- ☐ Have you given your employees time off to make blood donations?
- ☐ Do you have a Blood Donor Honor Roll in your company?
- ☐ Have you set up a list of volunteers so that efficient plans can be made for scheduling donors?
- ☐ Have you arranged to have a Bloodmobile make regular visits?
- ☐ Has your management endorsed the local Blood Donor Program?
- ☐ Have you informed employees of your company's plan of co-operation?
- ☐ Was this information given through Plant Bulletin or House Magazine?
- ☐ Has your company given any recognition to donors?
- ☐ Have you conducted a Donor Pledge Campaign in your company?

Remember, as long as a *single* pint of blood may mean the difference between life and death for *any* American . . . the need for blood is *urgent!*

Give Blood Now—Call Your Red Cross Today!

National Blood Program



ENGINEERING FUNDAMENTALS

ELECTRIC LOGGING—1

. . . Introduction to Theory and Practice

by R. I. Martin*

Correct interpretation of modern electric logs is of vital economic importance for logs can be used to reduce the waste of time and money caused by making unnecessary production tests to locate pay zones or potential pays.

The object of this series of reports is to present a review of the present state of knowledge of electric logging in such a form that it may be of direct benefit to administrative and technical personnel who deal with electric logs.

Many articles on electric logging are extremely technical and presuppose that the reader is well informed. Other descriptions are too elementary to be of help in dealing with field problems. These extremes have been kept in mind during the preparation of this series. Sufficient detail has been given, however, to form a foundation on which additional information may be built up by those interested in special phases.

ELECTRIC logging was introduced on a commercial scale early in 1929 and enjoyed immediate acceptance in those areas where subsurface conditions are complex. These logs made easier the solution of both problems of correlation and identification of pay zones. However, because of the many variables which affect the response of the logging devices it appeared that each region, and in some cases each well, became a special problem.

While it is still true that the interpretation of electric logs must depend heavily on local information, important contributions to an understanding of the fundamental theory have made the problem of interpretation somewhat easier.

Log interpretation is not an exact science but an understanding of the theory is essential if the best possible solutions are to be made for a given case.

Basic Types of Logs

At the present time there are 11 kinds of logs offered on a commercial basis. Classified by basic type they are:

1. Conventional resistivity logs made with four different types of spacing, and with different spacing lengths.

2. Comparatively modern resistivity logs such as the induction log, MicroLog, and shielded monoelectrode.

3. Conventional spontaneous potential logs and selective spontaneous potential logs.

4. Radioactivity logs of either natural radioactivity or both natural and imposed radioactivity.

In addition to these are auxiliary aids such as dipmeter surveys, caliper surveys, and directional surveys. It is obvious therefore that in addition to the problem of log interpretation, we are faced with the problem of selecting the best logging methods to meet a given situation. It is imperative that the good points and weaknesses of the various logs be known if a wise selection is to be made.

Limitations . . . Electric logs are run primarily with the expectation that they will indicate directly the presence of commercial pay zones. How far they fall short of this goal in many cases, may be judged by the number of logs developed and offered commercially to do this job.

Whether or not a log shows the presence of pays directly, important information is obtained. The log affords a continuous record of the formation penetrated, which forms an excelent basis for correlation. The response on resistivity and spontaneous potential curves is characteristic, and reproducible on successive runs.

From the preceding remarks it would appear that electric logging is superior to coring. In many respects it is, but it should be stressed that core samples have provided the basis of log interpretation. Once the relations between lithology and the electric log have been established the problem becomes simpler in many cases. In this connection it is essential that allowance for depth discrepancies between the cores and logs be made. This becomes more difficult when the core recovery is not complete, so that matching the core to the log may be complicated by possible alternative relationships.

It is important to remember also that a well is a point in the reservoir, and that the information obtained refers to that point. For example, a sand might appear most attractive on a log. A well completed in this sand might turn to gas in a few days, or to water in a few weeks depending on its location in the reservoir and the reservoir characteristics.

The interpretation of a log takes many factors into account. The objective is to complete a well which will give sustained production. In many cases it is impossible to attain this objective, but the correct interpretation of logs will reduce the amount of time and money spent making physical tests.

Because of the need for detailed local knowledge and also because time is at a premium in testing and completing wells, the best results are obtained when the local technical personnel are competent and empowered to make decisions.

*Assistant professor of petroleum engineering, Missouri School of Mines and Metallurgy.

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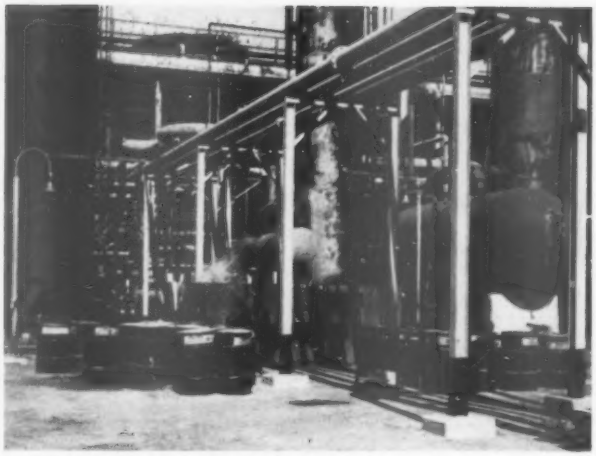

Turnaround time shortened one day by new cleaning method

Comparative report shows Oakite tower cleaning also cuts overall cleaning time 20%—saves on materials, too.

THIS well known refinery was not satisfied with the time it took to chemically clean equipment for Gas Recovery turnaround. To compare jobs and costs, Engineering decided to test two different methods—one of which used Oakite Compound No. 88.

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The refinery engineers' report on Oakite No. 88 speaks for itself. ". . . no gas disposal problem . . . no chance of running tower over . . . no static head to leak . . . no delay . . . cheaper from chemical consumption standpoint." Most important were these conclusions: "Oakite procedure should cut overall cleaning time by 20% . . . Recovery turnaround would be at least one day shorter."

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Summarizing—Cost of Handling and Firing Coal or Fuel Oil—3

by W. L. Nelson
Technical Editor

The cost of installations for handling and firing coal and fuel oil has been explored in the last two installments of this page.

A storage capacity of 7 days of coal in silos or bunkers is thought to be sufficient but at least 2 months' supply of coal on the ground may be necessary because of the frequency of strikes. Designers of oil equipment seem to feel that a 20-35-day supply of oil is adequate, but the storage provided here (Table 3) is for 45 days' storage.

The cost of entire installations is indicated in Table 4 for the same sizes of power plants as those of Table 1 (Part 1 of this answer, May 25, 1953). It is believed that the costs of the oil installations are conservatively high whereas the costs of the coal installations (Table 1) appear to be low.

The amount of steam required for pumping is very small. If 2 bbl. are circulated for each barrel burned, the amount of steam required is only about 4 lb. per barrel fired or about 6 lb. if the oil must be pumped to the plant. The steam required for heating depends, of course, upon the prevailing atmospheric temperature and the temperature required for firing. In general, the firing temperatures are 190°-260° F., for steam atomizing burners or 145°-210° F. for mechanical atomizing burners.[1] If the oil is heated from 60° to 240° F. (because many power-plant burners are of the mechanical atomizing type) and maintained at 240° F. when the prevailing atmospheric temperature is 60° F., the amount of steam required for heating and keeping the tanks hot is about:

Storage capacity, bbl.	Steam per bbl. fired
150	150
760	135
2,500	75
7,600	70
15,200	65

Of course, if the tanks are insulated the steam required is reduced to less than half of the above requirements. If steam atomizing burners are used, the atomizing steam amounts to about 140 lb. per bbl. (80-200 lb. per bbl.). The total of all of these steam consumptions are indicated in Table 5 for the standard sizes of plants of Tables 3 and 4.

Table 6 summarizes the total cost of handling oil. The fixed charges for retirement of the cost of the installation and for maintenance was computed as 10 per cent of the capital investment per year. The cost of steam in East Coast plants was thought to be about 60 cents per 1,000 lb. during 1951.

The Fairmont Coal Bureau[2] arrives at a cost of 14.5-21 cents per barrel (or 60-86 cents per 4.12 bbl.) and for the year 1941, reference No. 3 states 8.6-34.6 cents per 4.12 bbl. (or perhaps 17-70 cents now). These figures may be compared directly with the costs of handling coal

TABLE 3—COST OF OIL STORAGE

Size of installation: Tons coal per year	Size of installation: Bbl. oil per year	Oil storage, bbl.: Kind	Oil storage, bbl.: 45 days' storage	Installed cost*
300	1,240	1— 150	152	$1,150
1,500	6,200	1— 760	762	3,500
5,000	20,600	2—1,250	2,540	10,400
15,000	61,800	2—3,800	7,620	22,400
30,000	124,000	2—7,600	15,230	35,000

*Nelson, W. L., Costimating Series, The Oil and Gas Journal, 1948-49 and indexes of cost changes thereafter.

TABLE 4—COST OF OIL-HANDLING SYSTEMS

Tons coal per year (equivalent)	300	1,500	5,000	15,000	30,000
Barrels fired per year	1,240	6,200	20,600	61,800	124,000
Storage—45 days	$1,150	$3,500	$10,400	$22,400	$35,000
Pipe and fittings	610	970	1,375	1,430	2,140
Strainers, gages, etc.	300	300	360	360	400
Pumps	550	550	550	550	600
Total	$2,613	$5,320	$12,685	$24,740	$38,140
Total, incl. contingencies, engineering, etc.	$3,100	$6,400	$15,200	$30,000	$46,000

TABLE 5—STEAM REQUIRED IN OIL FIRING PLANTS—POUNDS PER BARREL FIRED

Barrels fired per year	1,240	6,200	20,600	61,800	124,000
Pumping	4	4	4	4	4
Heating	150	135	75	70	65
Atomizing	150	140	140	140	130
Total steam	304	289	219	214	199

TABLE 6—COST OF HANDLING OIL (NOT INCLUDING BURNERS)—CENTS PER 4.12 BARREL OIL (EQUIVALENT OF 1 TON OF COAL)

Size of plant, bbl. per year	1,240	6,200	20,600	61,800	124,000
Fixed charges	103.0	42.5	30.4	20.0	15.3
Steam	18.2	17.4	13.1	12.8	11.9
Total	121.2	59.9	43.5	32.8	27.2

Questions on Technology (continued)

(Table 2, Part 2 of this question, June 1, 1953) except that an additional cost of $0.60-$1.00 per ton should be added to the coal-handling costs for the fixed costs of stokers or pulverizers.

Summary

The extra cost of firing coal as compared with the cost of firing oil is about:

Size of installation—Tons coal per year	Bbl. oil per year	Saving by oil firing—cents per barrel*: A—Based on coal and ash handling equipment only in coal plant	B—Same as "A" except add 10 cents for greater efficiency of oil	C—Based on complete installation incl. pulverizers and also efficiency
300	1,240	(—2.9)	7.1	55.9
1,500	6,200	6.5	16.5	40.6
5,000	20,600	equal	10.0	29.2
15,000	61,800	8.7	18.7	34.5
30,000	124,000	8.0	18.0	29.9

*4.12 bbl. is the heating value equivalent of 1 ton of coal.

Note that the greater efficiency of oil firing (1 to 4 per cent and 3 per cent used here) adds about 10 cents per barrel to the advantage of oil. Note also that the great advantage shown in the last column cannot usually be realized because it is usually necessary to maintain standby pulverizing or stoker equipment even though oil is the fuel being fired.

References

1. Nelson, W. L.—"Fuel Oil Properties," The Oil and Gas Journal, Jan. 18, 1947, p. 89.

2. Fairmont Coal Bureau—"Coal and Ash Handling," Bull. No. 14, Dec. 15, 1951.

3. Anon.—"Greater Use of Coal in Refineries," Nat. Pet. News, Oct. 29, 1941, p. R-346.

"Sour" Crudes Require Special Handling

"In your "Penalty for Sourness in a Crude Oil" of the January 26, 1953, issue, you find that "sour" crude oils are worth only 6-8 cents a barrel less than "sweet" ones. This seems like too small a price difference. What is a more realistic penalty? R.F.A.

We still feel that 6-8 cents is a satisfactory but conservative penalty when comparing two oils that are similar in all respects (gravity, sulfur content, types of products, etc.) except that one oil is sour and the other is sweet. Only one authority has ventured to state such a penalty, namely, Walter Miller, of the old Marland Refining Co. (*Refining Panhandle Crude, The Oil and Gas Journal, 25, No. 29, p. 40B, 1926,* or A.P.I. Proceedings 8, No. 6 p. 309, 1927), and his statement of 25 cents per barrel penalty was for the year 1926. Since that time we have learned very much about economical ways to process sour crude oils. In addition, Miller compares Panhandle (or West Texas) oils with the superior lubricating-base oils being produced at that time in the Mid-Continent area. The lube crudes contained excellent lubricants and in addition they contained more gasoline than Panhandle crude oil. His statement follows:

"We have been asked many times our opinion as to the comparative value of Panhandle with crudes of similar gravities of average Mid-Continent type. We won't know actually for a long time. There are too many undeterminable factors to warrant any attempt to more than roughly estimate the difference in value to refiners. True, we can say how much our corrosion - combating chemicals are costing, but we don't know yet whether we are using the right amount. We can calculate the extra cost of treating the refined products but there is no way of determining as yet the cost, or measuring the rate of depreciation of our equipment. We have made several attempts to estimate this figure, taking into consideration the following factors: That of lower gasoline content than average crude of the same gravity; unavailability as a lubricating oil source; extra cost of combating corrosion and of treating products, our best guess as to the rate and cost of depreciation on equipment and the cost expressed in money, of loss of capacity due to extra shutdowns. Our figures have ranged from 23 to 28 cents per barrel less value to the refiner delivered at his plant. We believe that 25 cents is as fair a figure as can be arrived at today."

It is interesting to note that Panhandle crude oil is now considered as a satisfactory or good source of lubricating oils.

Metals for Centrifugal Pumps

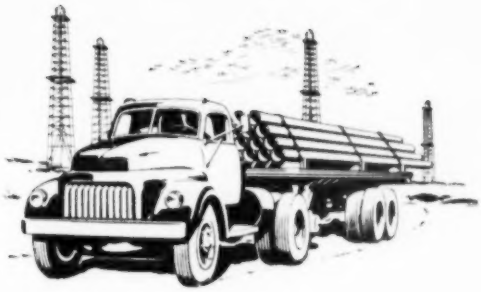
"What materials should be used for centrifugal pumps?—V.L.M.

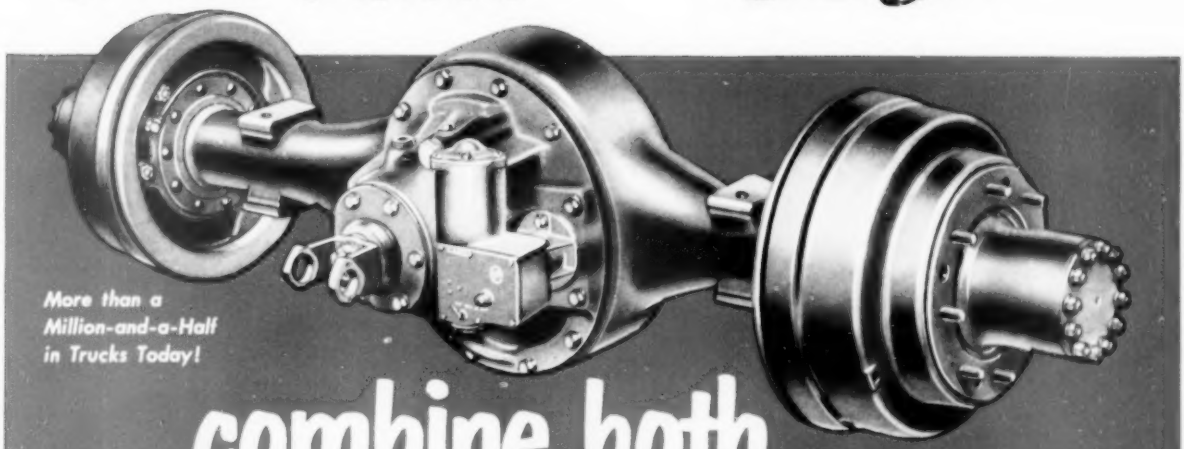
So many liquids are handled with centrifugal and rotary pumps that no all-purpose set of materials can be recommended. However, for most refinery services, the materials indicated in Table 1 will care for most situations. Pumps are a relatively expensive piece of machinery, and if the materials of Table 1 were employed for all services, the overall costs of maintenance, replacement, and repair would probably be reduced in most refineries.

TABLE 1—MATERIALS FOR CENTRIFUGAL AND ROTARY PUMPS

Part of pump—	Cold-water pumps	Hot-water pumps	Cold-process pumps—Low pressure	Cold-process pumps—High pressure	Hot-process pumps, high or low pressure	Slurry pumps
Casing	C.I.	C.I.	Cr-Ni iron	Steel	Steel	11-13 Cr steel
Impellers	Bronze	Bronze or C.I.	Chrome nickel iron		11-13 Cr steel	11-13 Cr steel
Case rings	Bronze	Bronze	Chrome nickel iron		11-13 Cr steel	11-13 Cr steel
Impeller rings	Bronze	Bronze	Chrome nickel iron		11-13 Cr steel	11-13 Cr steel
Shaft sleeves	Monel	Monel	No. 1 stellite on 18-8 steel		No. 1 stellite on 18-8 steel	No. 1 stellite on 18-8 steel
Lantern ring	Bronze	Bronze	Chrome nickel iron		11-13 Cr steel	11-13 Cr steel

Eaton 2-Speed Truck Axles





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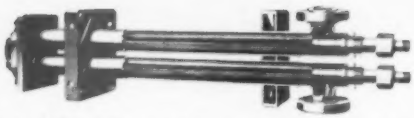
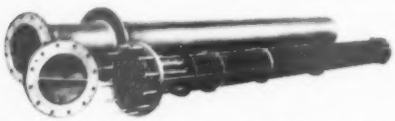
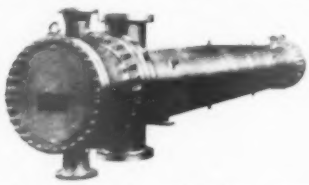


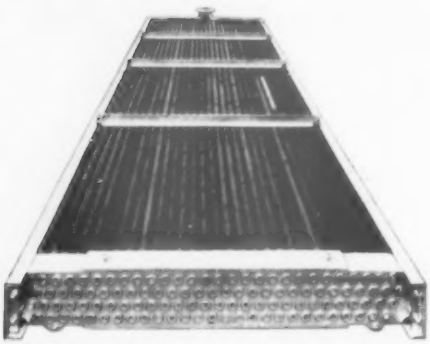
Twin G-Fin Section, used on a greater variety of heat transfer services than any other design of apparatus.



G-Fin Storage Tank Oil Heater, available in designs for installation partly within or entirely outside of tank.



G-Fin Heat Exchanger, for cooling large quantities of gases, or for cooling or heating viscous liquids.

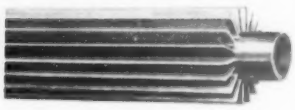


K-Fin Atmospheric Section, used in the Fin-Fan Air-Cooled Exchanger, many hundreds of which are in use all over the world.

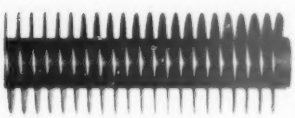
K-Fin Tar-Heated Reboiler, for separation of liquids which do not have close distillation curves.

K-Fin Air and Gas Cooler and Heater, widely used to cool air or hydrogen from generator windings.

Headquarters for Finned Tube Units



G-Fin Element with longitudinal fins



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EQUIPMENT MEN . . . in the News

Pazdral Appointed Agent For T. D. Williamson, Inc.

T. PAZDRAL

T. D. Williamson, Tulsa Manufacturer of pipeline tools, has announced the appointment of Tod Pazdral, Houston, as executive sales and service representative for South and East Texas, and Louisiana.

Pazdral's 25 years in the pipe-line industry include 9 years' experience with application and use of Williamson pigs, WmSON-Hillco tapping machines, WmSEAL casing bushings, and concentric-support insulators. Pazdral is also president of Pazdral & Whitaker Construction Co.

As agent for Williamson, Pazdral will be assisted by James H. McBrien who has completed 18 months' field experience with all Williamson products in pipe-line and refinery applications throughout the United States and Canada.

Billings Is Made Manager Of Pelton Division

D. P. BILLINGS

W. F. Boyle, vice president and general manager of Pelton Water Wheel Co., has announced the appointment of D. P. Billings as manager of Pelton's oil-industry - machinery division.

Billings has been with the Pelton organization for 8 years, the last 4 of which he was chief engineer of the oil-industry-machinery division. In his new position, Billings will head up all engineering, manufacturing, and sales activities in conjunction with his company's development in the long-stroke hydraulic pumping unit field.

Waukesha Sales & Service Named Kohler Distributor

Waukesha Sales & Service, Inc., has recently been appointed distributor for Kohler electrical plants and engines. A complete line of Kohler engines and repair and replacement parts is now available at all Waukesha Sales branches in Texas, New Mexico, and northern and western Louisiana.

These electrical plants, manufactured by Kohler of Wisconsin, provide an independent source of electricity capable of performing hundreds of routine needs as well as standby protection against power failure.

Baash-Ross Transfers Wallace to Kansas Area

Baash-Ross Tool Co. has announced that W. H. (Bill) Wallace has recently been transferred to the Kansas area to handle steadily increasing sales activities in that area.

Wallace has been with Baash-Ross in its Mid-Continent operations for about 5 years, and has had extensive experience in oil-tool industry, both in field and shop operations as well as in sales activities. He will make his headquarters in Great Bend, Kans.

Muldrow Aerial Surveys To Offer New Base Maps

Muldrow Aerial Surveys Corp. is constructing regional base maps of prospective oil area of western Canada, involving approximately a quarter of a million square miles of controlled mapping, according to M. Ellison Muldrow, president of the mapping firm.

Mrs. Ellison Muldrow, only woman executive in the mapping and survey business, and one of the few to head a large engineering firm, stated that she had spent the summer in Saskatchewan and Alberta obtaining preliminary data. Basic information is now being compiled through the Deportment of Natural Resources, Survey Branch, Department of Lands and Forests, and Department of Technical Surveys; all are branches of provinces of the Dominion of Canada. Stanolind Oil & Gas Co. was contracted to buy this coverage.

Mrs. Muldrow further stated that the Canadian mapping was only a part of the controlled base mapping that Muldrow Aerial Survey Corp. was planning, in line with expanded activities of the company.

Parkhill Truck Co. Under New Ownership

K. A. OWEN

Ownership and management of Parkhill Truck Co., of Tulsa, one of the world's oldest and largest oil-field-handling and pipe-line - stringing firms, has changed hands. Roy F. Parkhill, founder and principal owner of the pioneer company, has sold his interest to Kenneth A. Owen, president; Trap Briscoe, vice president and general manager, and Howard S. Lipp, vice president, all of Tulsa.

Parkhill formed Parkhill Truck Co. in Okmulgee, Okla., 33 years ago. Starting with only two small trucks, the equipment taken over by the new owners of the company includes more than 200 units, including trucks, tractors, full-swing cranes, trailers, floats, and low-boy equipment necessary to handle any size job.

T. BRISCOE

H. S. LIPP

Owen began his pipe-line career with The Texas Pipe Line Co., and after 7 years with Texaco, he joined Burt Hull with War Emergency Pipelines, Inc. He was later affiliated with Williams Brothers where he was assistant to Miller Williams and Guy Conners, general manager. He later became a stockholder and vice president of successor companies to the original Williams Brothers group.

Formerly chief accountant for Brown Shipbuilding Co., Houston, Briscoe went with Parkhill Truck as secretary-treasurer in 1946.

Following 22 years with Peoples Gas, Light & Coke Co., of Chicago, Lipp joined Midwestern Contractors, Inc., in 1947 as general manager of its operations in the Chicago area. In 1949 he

transferred to Tulsa as vice president of Midwestern, where he remained until the early part of 1953.

American Cyanamid Division Name Change

The name of the Petroleum Chemicals Department, Industrial Chemicals Division, of American Cyanamid Co., has been changed to Refinery Chemicals Department.

The Refinery Chemicals Department will handle the full line of synthetic fluid cracking catalysts, specialty catalysts, lubricating additives, and drilling mud conditioners formerly handled by the Petroleum Chemicals Department.

Albert Elected President of New Trade Association

E. R. ALBERT

Oilfield mud distributors, with dealerships throughout the nation, organized a trade association known as "National Oil Field Mud Distributors, Inc." at a meeting held recently in Houston.

E. R. (Dick) Albert, Jr., Tulsa, president of Mud Products, Inc., The Bomud Co., and Beaumont Cement Sales Co., was elected first president of the new association.

The association is a nonprofit group whose purpose is to promote the interest of all members to interchange information among them and to represent the members in various dealings with the government regulatory bodies and with oil-field mud manufacturers and other persons with whom the distributors customarily do business. Principal office of the new association will be in New Orleans.

Other officers elected were: Ike W. Hoskins, Mud Supply Co., Lake Charles, La., vice president; Zeke Fowler, Kaffie Lumber & Building Co., Corpus Christi, Tex., secretary, and Nathan B. Gary, Gary-Nees Lumber Co., Bowie, Tex., treasurer.

Honeywell Adds 25 to Industrial Division Sales

Twenty-five sales engineers were recently added to the field sales force of Minneapolis-Honeywell Regulator Co.'s industrial division, it has been announced by J. A. Robinson, field sales manager. The new appointees are all recent graduates from the company's industrial instrument training school in Philadelphia.

The new salesmen who will be assigned to 20 cities in 16 different states are: John D. Lewis, New York; George H. Negley, East Orange, N. J.; Thomas L. Mogren, Syracuse; John E. Rattinger, Boston; William H. Hockersmith, Harrisburg; Jack Hopkins, Greenville; Lee H. Nelson, Knoxville; Frank E. Graf, Birmingham; E. A. Spellerberg, Columbus; Joseph H. Toifel and Howard P. Smith, Pittsburgh, and Robert G. Wren, Pat J. Calabrese, and William F. Yasdick, Chicago.

Also, Carroll J. Cheslousky and Richard D. Horbinski, Milwaukee; Harold L. Brandt, Des Moines; Robert H. Waggener, Houston; Stanley V. Preskitt, Dallas; Leonard S. Hester, Kansas City; Rodman E. Street, Denver; Robert O. Hutchinson, Portland, Ore.; William T. Lisenby, Los Angeles, and Larkin L. Blake and Theodore G. Lyston, San Francisco.

Harbison-Fischer Field Men Meet in Fort Worth

Harbison-Fischer Manufacturing Co. conducted a 2-day sales meeting at the company home office and plant in Fort Worth recently to demonstrate a new "double-displacement" subsurface pump to its factory representatives. The new pump, developed with Wilson Manufacturing Co. of Houston, will be marketed as Haribison-Fischer Wilson "double-displacement" rod pump. In attendance were, front row: Bill Sutton, Monahans, Tex., and Ralph Crenshaw, Houston, Wilson Supply Co.; Don King, Harbison-Fischer representative in Seminole, Okla.; DeVerne Chamblin, Grayville, Ill.; Bill Webster, Pampa, Tex.; Ish Brown, Wichita Falls; Rex Lawrence, Alice, Tex.; Louis Baker, Abilene, Tex.; Einar Hofstrom, Ellinwood, Kans., and J. L. Chance, Kilgore, Tex. Back row: DeRoy Lewis, Fort Worth; Bill Wells, Houston; Art Donnelly, Odessa, Tex.; Dick Harbison, Fort Worth; Harry Day, Kilgore; Barney Horrigan, Magnolia, Ark.; Don Nicholson, Hobbs, N. M.; Lawrence Harbison, Fort Worth; Jimmy Slough, Fort Worth; and Earl Bonnell, El Dorado, Kans.

New York Nomads Entertain Foreign Guests

Visitors who attended a recent New York Chapter of Nomads' party at Hotel Biltmore in New York City, and two newly inducted members were, seated: P. K. Ozinga, Caribbean Petroleum Co., Venezuela; G. Rovira, YPF Bolivianos, Washington, D. C.; A. L. Burns, Gulf Publishing Co., Houston; C. H. Bowersox, Mene Grande Oil Co., Venezuela; and G. H. Moore, Magnet Cove Barium Co., Houston. Standing: C. B. Antill, C. B. Antill & Co., Corpus Christi, Tex.; O. W. Van Dyke, Magnet Cove Barium Co., Houston; A. G. Chandler, Reed Roller Bit Co., England; L. J. Hopkins, Basrah Petroleum Co., Basrah, Arabia; A. Heinle, Gewerkschaft Brigitta, Germany; A. Zwerneman, Atlas Pipe Co., Houston; C. E. Mays, Parkersburg Rig & Reel Co., Venezuela; Nelson Bigelow, Gulf Publishing Co., New York (newly inducted Nomad); Glenn Dow, Mid-Continent Cummins Export Corp., New York (newly inducted Nomad); W. M. Thornbury, Thornbury & Geis, California, and R. J. Rhodes, Parkersburg Rig & Reel Co., Allentown, Pa.

ANOTHER *Electric Power* CASE HISTORY

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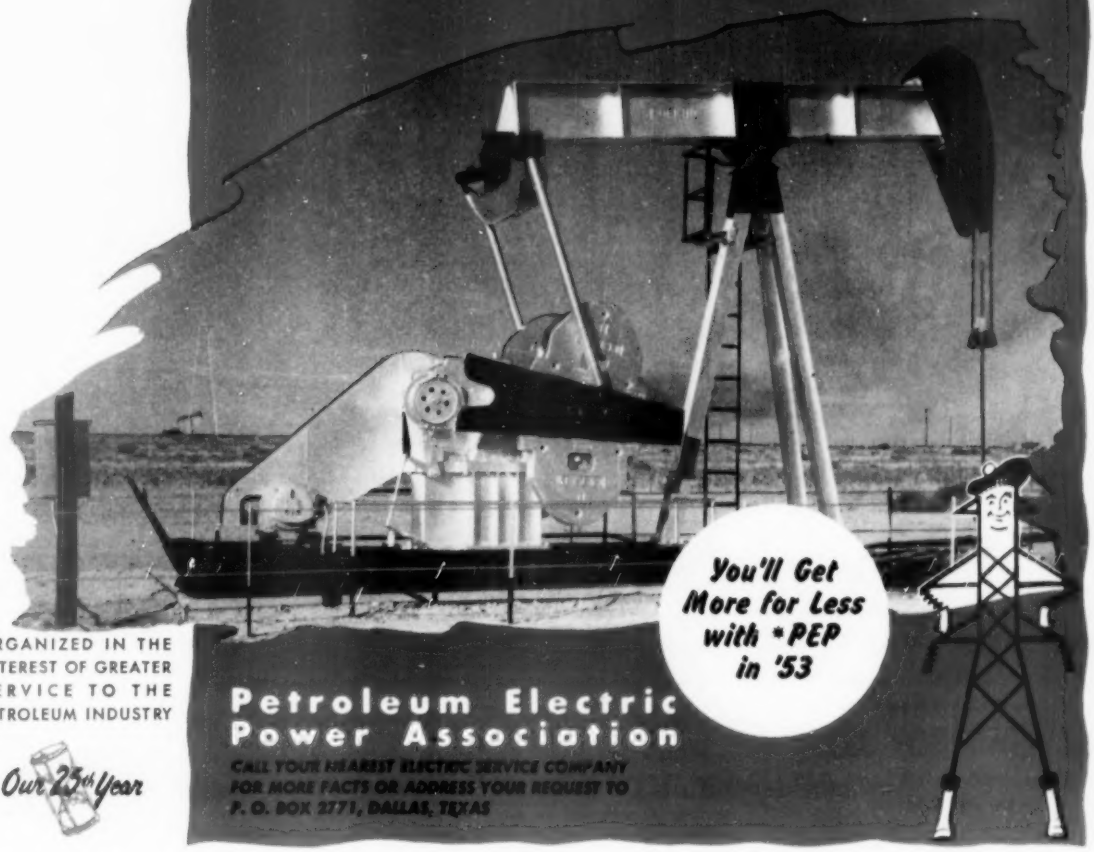

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Tests made in various sections of the country show that Galvo-Pile is another effective item in the line of "tools" available for solving your corrosion problems. The elimination of backfill and the simple method used in driving this anode make it ideal in many locations, particularly in swamps and similar areas. Also, the savings in installation time alone will be of definite interest to you.

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PIPE LINES

Price, Houston Contracting to Lay Gulf Interstate Line

TULSA.—One of the largest pipeline contracts ever let has been awarded by Gulf Interstate Gas Co. to Houston Contracting Co. and H. C. Price Co. for construction of Gulf Interstate's 860-mile, 30-in. main line.

Even though the contract was let jointly, construction will not be a joint venture. Both contractors assume responsibility for completing the main line.

Houston Contracting will lay the section of line from a point near Lake Charles, in Acadia Parish, Louisiana, to a point near Kinkade, Tenn. H. C. Price will lay the remainder from Kinkade to the terminal in Boyd County, Kentucky, between Ashland, Ky., and Kenova, W. Va.

In addition Anderson Brothers Corp. and Williams Brothers Co. will put down more than 230 miles of gathering lines. Trunkline Gas Co. is serving as the engineering organization in charge of design and construction.

A total of 40,000 hp. in compressor facilities will be installed at five stations for the initial delivery capacity of 375,000,000 cu. ft. daily. By adding five stations the company expects to increase capacity in the future to 565,000,000 cu. ft. daily.

Gulf Interstate officers include W. G. Maguire, chairman of the board; Hy Byrd, president; G. M. Woodfin, vice president and secretary; and Leith V. Watkins, treasurer.

ROUTE of $129,541,000 Gulf Interstate Gas Co. system scheduled for construction in 1953 and 1954.

Preliminary Work Begins On Texas Pipe Line System

HOUSTON.—Texas Pipe Line Co. has begun preliminary work on construction of gathering-line facilities, including about 26.3 miles of pipe lines, in Cedar Creek pool at Glendive, Mont.

Actual work is expected to start around July 1, and completion is set for September 1, 1953.

Initial installation will consist of

Heavy Rains Demand Extra Equipment

Heavy rains and mud between Bunkie and Melville, La., caused construction crews laying Interstate Oil Pipe Line Co.'s 20-in. crude-oil trunk line to use an extra tractor to assist two side-boom tractors used in coating and wrapping operations. A 3/32-in. coating of hot applied coal-tar enamel reinforced with a glass fiber wrap was put on the pipe to prevent external corrosion. During laying operations the coating was protected by a wrap of kraft paper.

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14.65 miles of 8-in. main gathering system, and 9 miles of 4-in. and 2.77 miles of 6-in. lateral lines leading to the producers' settling tanks. Crude will be delivered to a rail-head loading rack for tank-car shipments.

FCC Issues Radio Service Permits to 7 Companies

WASHINGTON.—Construction permits for nine base stations, 267 mobile units, one fixed control station, and one fixed relay unit in the petroleum radio service have been issued by the Federal Communications Commission as follows:

Sinclair Pipe Line Co., for one base station on 153.17 mg. and one fixed relay unit on 456.15 mg. at Jacksonville, Tex., and for one fixed control station on 457.85 mg. at Troup, Tex.

United Natural Gas Co., Oil City, Pa., for one base station near Lewis Run, Pa., on 48.98 mg.

Sohio Pipe Line Co., St. Louis, for four base stations at Fairfield, Salem, and Centralia, and Clay City, Ill., and for 35 mobile units on 153.29 mg.

Northern Natural Gas Co., Omaha, for one base station near Lefors, Tex., on 33.18 mg.

Salt Lake Pipe Line Co., Salt Lake City, for 100 mobile units in western United States on 158.37 mg.

Hope Natural Gas Co., Pittsburgh, for one base station at Yawkey, W. Va., and for 132 mobile units on 48.70 mg.

Texas Eastern Transmission Corp., for one base station at temporary locations in southwestern, central, and eastern United States on 48.94 mg.

N.A.C.E. Publishes Report on Preparation for Coating

HOUSTON.—A second interim report on methods of preparing steel surfaces for coatings has been published by the technical practices subcommittee 6-G of the National Association of Corrosion Engineers.

The first interim report was issued in August 1950. A. J. Leibman, Dravo Corp., Pittsburgh, is committee chairman.

The report discusses accepted standards and safety measures. Included are recommendations on how steel may be prepared for painting with organic and other coatings by means of weathering, wire brushing, grinding, flame conditioning, nozzle blast cleaning both wet and dry, wheel blasting, chemical pickling, electrolytic pickling, surface conditioning and numerous other related methods.

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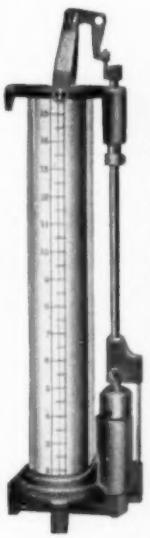

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Service to Start Work Soon On Crude Line to Mandan

WATFORD CITY, N. D.—O. R. Burden Construction Corp. will begin laying 12-in. pipe June 22 on Service Pipe Line Co.'s 153-mile, 12 and 16-in. crude line from the Tioga-Beaver Lodge, North Dakota, area to Mandan, N. D.

Field headquarters for the spread which will lay the 12-in. section of the line has been set up at Watford City. Two Burden spreads will begin work on the 16-in. section of the line in September. The location of the field office for this work has not yet been chosen.

Service also has let contract to C. P. Bartley & Son for construction of about 55 miles of 4, 6, and 8-in. gathering lines in the Tioga-Beaver Lodge area. These lines will be laid throughout the year as arrangements are made for well connections. Field headquarters for this work has been established at Tioga.

Southern California Plans Two Compressor Stations

LOS ANGELES. — Southern California Gas Co. is building two 5,000-hp. gas turbine-driven centrifugal compressor stations, one located near Desert Center and the other near Cactus Center, Calif.

Construction of the compressor installation and station piping is being handled by Macco Corp. Electrical work is done by Fielding Electric and foundations have been contracted by J. B. Gill.

In connection with enlarging mainline facilities, Southern California has laid 14 miles of 30-in. loop extending eastward from Whitewater, Calif., which was contracted by Alex Robertson Co. A 6.3-mile, 30-in. loop between Blythe, Calif., and the Colorado River has been laid by Pacific Pipeline Construction Co.

Bureau Reissues Bulletin On Gas Pipe-line Leakage

WASHINGTON.—The U. S. Bureau of Mines has reissued its bulletin on "Leakage from High-Pressure Natural-Gas Transmission Lines."

The investigation upon which the bulletin is based was one of the first projects undertaken by the Bureau of Mines in cooperation with the American Gas Association. It included more than 200 leakage tests on 75 pipe lines in most of the natural gas districts in the nation.

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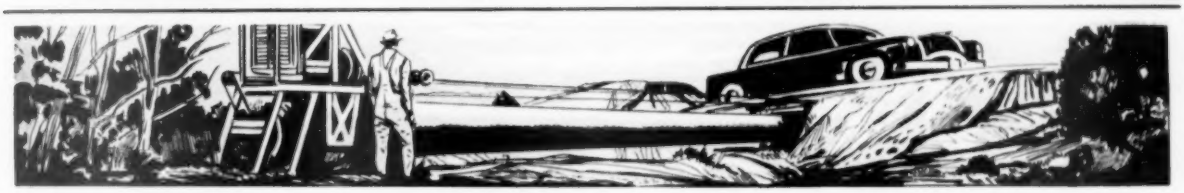

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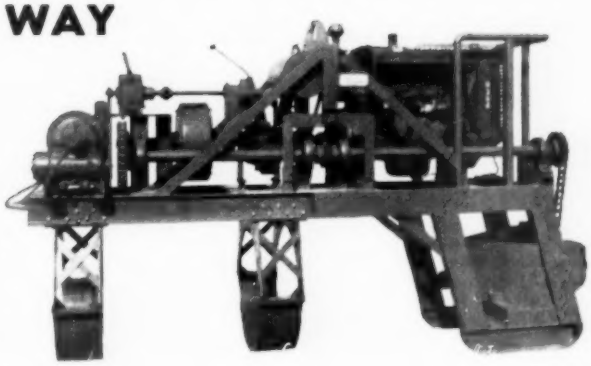

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Among the Drilling Contractors

New Drilling Company To Operate in Kansas

Greenland Drilling Co. is a newly formed contracting company with operating headquarters in the Union National Bank Building, Wichita, Kans. George H. Bunting, Jr., Kansas City, is president and treasurer; Richard S. Davis, Wichita, executive vice president and secretary; and Oscar Bridge, Great Bend, Kans., vice president in charge of drilling and field operations.

Bunting has operated extensively throughout Kansas and Oklahoma for the past 15 years. He was one of the original partners in the former Nelson Drilling Co., now the Mallard Drilling Co. of Wichita. Davis has been an active independent operator in Kansas for the past 8 years. Bridge has been drilling superintendent for Jackson Drilling Co., subsidiary of Westgate-Greenland Oil Co., Wichita, for the past several years.

The company not only will engage in straight contract drilling but will take "deals" and operate for its own account.

Texita Oil Co. has contracted one of its rigs to C. G. Dunwoody, Jr., of Houston, for a well-deepening job in Atascosa County, Southwest Texas. The hole to be deepened was abandoned about a year ago at 1,855 ft. It will be carried to 5,500 ft. It is a wildcat, 1 Jahn, located in the Anson G. Neal Survey, about a mile south of the Charlotte field.

Stewart & Richardson, contracting for Taylor Oil & Gas Co., are starting a 13,000-ft. test in Hidalgo County, in the Rio Grande Valley of South Texas. Location is for 1 Alexander in Survey 30, northeast of McCook, and about midway between the Monte Christo and Arrowhead fields.

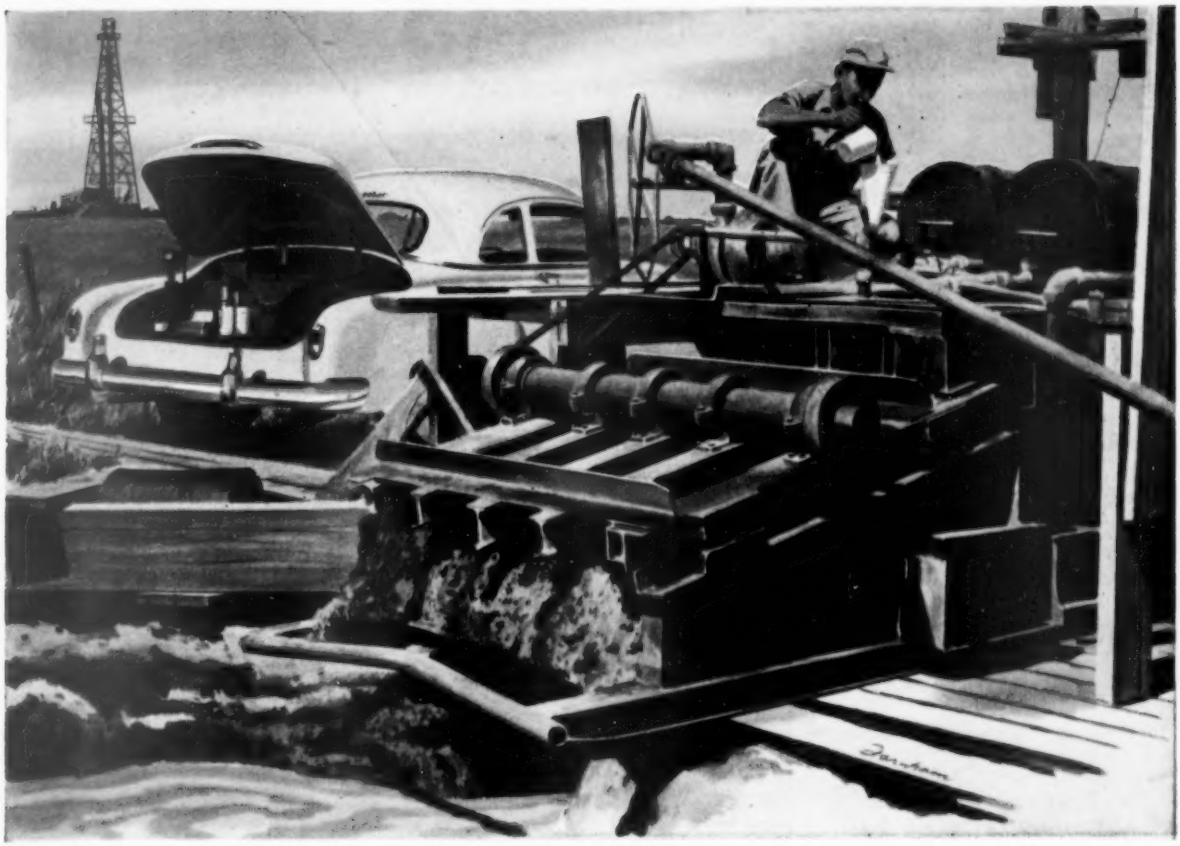
Arrow Drilling Co. is drilling a 13,000-ft. test for Helmerich & Payne, Inc., at a wildcat location 1¼ miles southwest of shallow production in the Knox field, Grady County, Oklahoma. Location is for 1 Hanson, in the C NE SE 31-3n-5w.

Coulston Drilling Co. is drilling a wildcat test 3 miles southwest of Hallsville, in Harrison County, East Texas. It is a contract job for F. R. Jackson. Location is in the Richard Hooper Survey and is carried as 1 Sypert.

Kemp Drilling Co. is drilling for BBM Drilling Co. at 1 Lazaro and associates, a projected 9,500-ft. Cockfield test in 40-4s-3e, St. Landry Parish, Coastal Louisiana.

Sutton Drilling Co. has a new wildcat operation under way in northeastern Gonzales County, Southwest Texas,

On the floor of a heavy-duty rotary rig J. R. B. Drilling Co., Houston, is operating in the Old Ocean field, on the Brazoria-Matagorda county line, Texas Gulf Coast. Standing, left to right: W. L. Taylor (driller), J. L. Haynes, and C. Koteras. Kneeling: G. D. Bass (left) and J. D. Coker. Rig is on a well drilled for J. S. Abercrombie Co. (Picture by courtesy Mission Manufacturing Co., Houston.)



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where it is drilling for James Doughty at 1 Robinson, in the James Gibson Survey. Location is about 6 miles east of Waelder. Contract is for 3,000 ft.

Warren & Burdette Drilling Co. has contracted for an 8,000-ft. test to be drilled for Lamson, Bennett & Cole at a wildcat location, 1 Lutcher-Moore, ¾ mile southwest of Lucas, in Calcasieu Parish, Louisiana Gulf Coast. Location, in 15-8s-12w, is about 4 miles southeast of the North Starks field.

Southern Production Co. has a new 11,000-ft. operation under way for the California Co. in the Coquille Bay area, southeastern Plaquemines Parish, Louisiana Gulf Coast. The test is 7 Louisiana State Lease 1786, a water-located job.

Power Rig Drilling Co., Lafayette, La., is starting an 8,500-ft. Cook Mountain test at a wildcat location 4½ miles northeast of Bancroft, in Beauregard Parish, southern Louisiana. The test, 1 Lutcher-Moore, is a contract job for W. H. Francis, Jr., of Houston. Location is a mile west of the West Bivens field, in 15-5s-12w.

Milton Crow, Inc., Shreveport, will drill a 6,200-ft. Travis Peak wildcat test for Ashland Oil & Refining Co. at 1 King, in 12-21n-7w, 2½ miles north of Homer, in Claiborne Parish, North Louisiana.

Cook Drilling Co., El Dorado, Ark., has a new contract job under way for Murphy Corp. on the southeast side of the Ruston field, in Lincoln Parish, Louisiana. Location is for 1 McCrary, in 5-18n-2w.

Petrie Drilling Co. is starting another wildcat test for Intex Oil Co. in the Little Tujunga area of San Fernando Valley, California. Location of the new test is in 33-3n-14w.

ACTIVE ROTARY RIGS*

Area—	Week ended 6-1-53	Change week ended 5-25-53	Change week ended 6-2-52
Gulf Coast	607	+10	— 20
N. & W. Tex.-N. M.	790	+12	—186
Ark.-N. La.-E. Tex.	121	+ 3	— 25
Oklahoma	341	+14	+ 22
Kans.-S. Neb.	178	+10	— 8
Illinois-Eastern	139	+20	— 11
Rocky Mountains	241	+ 5	+ 6
Pacific Coast	168	+ 4	0
Total U. S.	2,585	+54	—222
Western Canada	172	+34	— 6
Total	2,757	+88	—228

*Courtesy Hughes Tool Co. Trends in drilling activity in the United States, Gulf Coast, and Arkansas-North Louisiana-East Texas are shown on pages 185 and 186.

M. F. Fisher is contractor on a wildcat test which C. E. Starr is starting at 1 Mackey and others, 10 miles northeast of Lockhart, in Caldwell County, Southwest Texas.

San Joaquin Drilling Co. has a contract with Standard Oil Co. of California to redrill and deepen an old well, No. 74-7Q, in the Kettleman Hills North Dome field. The hole, previously completed at 8,300 ft., will be carried to approximately 9,000 ft. It is one of several old wells in the California field which the company plans to deepen.

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HOUSTON

NATURAL GAS

Johnston to Spend $350,000 On San Juan Development

HOUSTON.—The newly organized Johnston Oil & Gas Co. plans to use about $350,000 from prospective stock sale proceeds for drilling nine net wells during the next 12 months on its San Juan basin holdings.

The company proposes to present at public offering some 500,000 shares of common stock through Allen & Co., managing an underwriting group. Johnston Oil expects to raise approximately $2,200,000 from the stock sale.

Paul H. Umbach, consulting geologist of Denver, estimated the company's San Juan basin lease and royalty acreage holdings, which are located mostly in San Juan and Rio Arriba counties of northwestern New Mexico, have net reserves of natural gas totaling more than 265 billion cubic feet. From this total an estimated 2.3 million barrels of liquid hydrocarbons can be extracted, Umbach estimated.

As of May 1, the company had an interest in 14 gross wells, with a net interest of 6.04 wells. Also, it possessed 79.3 per cent interest in another well not yet completed.

Johnston Oil has contracts to supply gas to El Paso Natural Gas Co., Southern Union Gas Co., and Pacific Northwest Pipe Line Corp.

Blackstone's Motion for Early FPC Decision Denied

WASHINGTON.—The Federal Power Commission has denied a motion by Blackstone Valley Gas & Electric Co., Pawtucket, R. I., that its application be separated from other consolidated proceedings involving natural-gas service in New England and decided immediately.

Blackstone asked for an FPC ruling ordering Northeastern Gas Transmission Co., Springfield, Mass., to extend its pipe-line facilities to a connection with Blackstone's and sell natural gas to the Pawtucket firm. Hearings are now under way on competitive applications of Northeastern and Algonquin Gas Transmission Co., Boston, both of whom seek to serve Blackstone and other areas in New England.

Well-Head Prices Increase

AUSTIN.—The Texas Railroad Commission has announced well-head prices for natural gas have increased nearly 8 per cent in the past year.

As of May 6 prices for sweet gas averaged 7.49 cents per M.c.f. based on a 16.4 psi. pressure base. A year ago the price was 6.9372 cents.

The price for gas at a 14.65 psi. pressure base was 6.6908 cents per M.c.f., as compared with 6.1970 cents a year ago.

Hugoton Field Quotas Revised

AUSTIN.—The Texas Railroad Commission, acting on an application of Phillips Petroleum Co., will revise quotas for Texas Hugoton field gas wells under a newly developed formula.

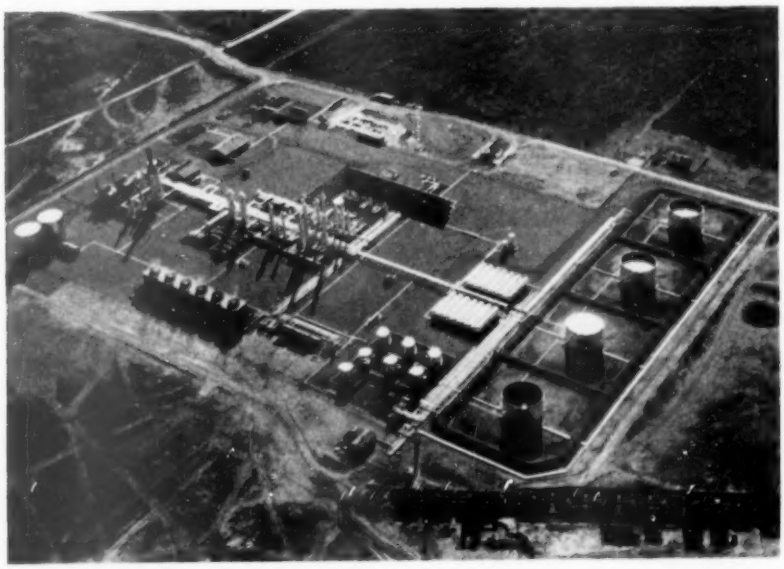
The method of taking tests on which well deliverability is measured for proration purposes was prescribed in the order. Commission engineers claim the effect will be to reduce output from some large capacity wells and increase that of other wells accordingly.

FPC to Begin Hearing on Big Natural-Gas Rate Hike

WASHINGTON.—The Federal Power Commission will begin hearings June 10 on Tennessee Gas Transmission Co.'s proposed $16,750,000 wholesale natural-gas rate increase.

The system-wide increase was suspended by the FPC September 12 last year, but it has been in effect under bond and subject to refund since February 15. The increase was based on estimated 1952 operations by Tennessee.

The commission has directed Tennessee to present its complete case-in-chief before cross-examination is undertaken.



Texas Cycling Plant

The Burnell-North Pettus cycling plant, shown above, located 5 miles northeast of Pettus, Tex., is capable of processing 166,000,000 cu. ft. of gas daily. Operated by Stanolind Oil & Gas Co. for a group of owners, the plant is designed to produce 170,000 gal. of gasoline; 20,000 gal. of kerosine, fuel oil, and absorption oil; 76,000 gal. of propane; and 69,000 gal. of butane per day.

Natural Gasoline

Work on Permian Basin Plants Begins Near Hobbs

HOBBS, N. M.—Work has started on four Permian Basin Pipe Line Co. facilities, being built near here at a cost of approximately $2,000,000.

Dresser Engineering Co. is constructing a compressor station, a sulfur-removal plant, a dehydration plant, and a natural-gasoline plant. R. H. Fulton Co. will lay 16, 20, and 24-in. gathering lines to carry gas to the plants.

Permian Basin is a 55 per cent subsidiary of Northern Natural Gas Co., Omaha. The new installations are part of a $100,000,000 program to increase Northern's natural-gas transmission capacity by 200,000,000 cu. ft. daily this year and 300,000,000 cu. ft. in 1954.

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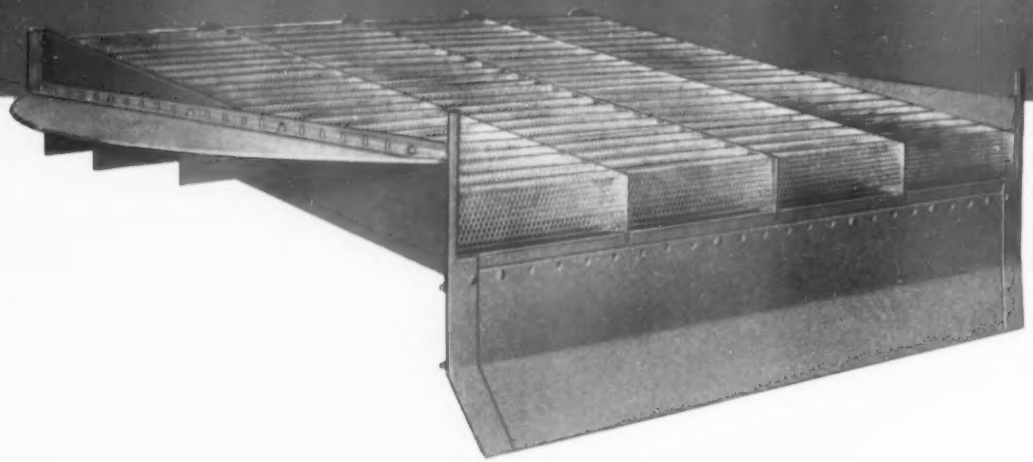

CASE HISTORY No. 1 . . .

One refiner was operating a 7.5' vacuum tower which was limiting capacity and yields due to the pressure drop of existing bubble trays. Capacity desired was:

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This refiner replaced the bubble trays with "Benturi" Kaskade trays on the same supports, and is now obtaining a pressure drop of less than 1.0 mm hg pressure drop per tray.

CASE HISTORY No. 2 . . .

An engineering firm recognized a pressure drop problem with a process duty equivalent to:

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Liquid . . . . . 965,000 #/hr of 62.4 #/cf density

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REFINING

Saving With Resid

It has big possibilities, but many problems remain

MILWAUKEE.—The use of residual-type fuels in marine and industrial diesel-engine applications offers the possibilities of large savings in fuel costs. But a number of problems stand in the way of efficient utilization.

These problems will be compounded in the future as residual fuels become successively less adaptable to diesel use, according to four Socony-Vacuum Oil Co., Inc., authors, who reviewed the subject recently at the oil and gas power conference of the American Society of Mechanical Engineers.

They visualize the residual fuel yield in this country as dwindling from the present average of about 19 per cent on crude charged, to less than 10 per cent by 1970. As the fraction shrinks, on the average, A.P.I. gravities will decrease, viscosities will rise, and the carbon residue, sulfur content, and ash content will continue upward. Since all of these characteristics detract from successful utilization as a diesel fuel, they foresee many problems which must be overcome if this source of fuel is to find economic utilization for diesel power.

Centrifuging . . . As A.P.I. gravity approaches that of water, centrifuging will become less efficient for water removal, even at elevated temperatures. Flashing to steam may be followed, but measures must be taken to prevent vapor binding of injection pumps and erratic injection. A new study on salt water removal by centrifuging indicates successful results by mixing in fresh water and an emulsion breaker. It is believed that 90 per cent or higher salt water removal can be obtained on a commercial basis, although this method does not appear feasible for marine applications.

Concerning viscosities, the authors warned that the pressure-viscosity relationship unless fully understood will result in trouble even with heated fuels, and injection system modifications will be necessary. Sulfur content, presently ranging from 1 per cent to 3 per cent, may go as high as 5 per cent in the future. The indications are that it may be possible to combat effectively the effects of increased sulfur content in diesel fuels through use of specially compounded lubricating oils. Further work on this subject is needed, along with studies of the influence of such other fuel factors as ash content on engine wear.

Work Starts on Cities Service Marine Terminal

FERRYSBURG, Mich.—Work has started here on Cities Service Oil Co.'s new marine terminal, which is scheduled to be in operation by November.

It is estimated in excess of 30,000,000 gal. of products annually will move through the terminal when it reaches full operations. Areas to be served include Grand Haven, Muskegon, Ionia, Grand Rapids, and Reed City.

The terminal will receive petroleum products by lake tanker from Cities Service's refinery at East Chicago, Ind. Products will be moved out of the terminal by truck.

Initial plans include building of four large storage tanks with a total capacity of approximately 7,500,000 gal.

PAD Conducts Survey of Foreign Refining Industry

WASHINGTON. — The Petroleum Administration for Defense is conducting a survey of the foreign refining industry to determine the capabilities of the industry in the free world. The purpose of this work, which will supplement a recent survey of U. S. refining facilities, is to enable PAD better to carry out its long-range defense-mobilization program.

Refiners abroad are being asked to outline capacities and operations through 1957, including crude runs, product yields, and type of facilities in operation, under construction, and planned.

Ohio Oil Signs Contract To Build Alkylate Unit

WASHINGTON. — One more step toward the 30,000-bbl. per day alkylation expansion goal of the Petroleum Administration for Defense was marked last week, as Ohio Oil Co. signed a facilities contract with the Armed Services Petroleum Purchasing Agency for a new unit.

The company plans to add a 1,500-bbl. unit which will cost about $1,800,000 at its Robinson, Ill., refinery. The contract, under which ASPPA agrees

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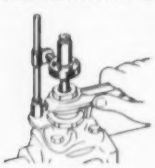

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to buy the product or reimburse the company for construction costs, is now being considered by ASPPA before final approval.

PAD reports that applications for 8,000 bbl. per day in new alkylation facilities have been filed, and that negotiations are now in progress covering an additional 7,000 bbl. in daily capacity of the prime avgas component.

According to ASPPA, the requirements of 115-145 avgas for fiscal 1954 will be about 5,000,000 bbl. higher than for the current fiscal year, ending June 30.

Bureau Prepares Report On Aviation Fuels Study

WASHINGTON.—The U. S. Bureau of Mines has published a report on its aviation-gasoline and jet-fuels survey for 1952.

Of 94 samples of aviation gasoline on which the report gives information, 35 represent fuel for commercial use only, 33 fuel for military use only, and 26 for both commercial and military use. For the first time information has been given on five samples of grade 108/135 aviation fuel.

O. C. Blade, petroleum chemist at the bureau's Bartlesville, Okla., station, prepared the report. Twenty-two American manufacturers tested typical samples of their products and sent the information to the bureau for compilation. The bureau cooperates with the American Petroleum Institute in conducting this survey and similar ones on motor gasoline and diesel fuels each year.

Petrochemicals

Celanese Producing New Petrochemicals at Pampa

PAMPA, Tex. — Celanese Corp. of America is now in large-scale production of propionic acid and butyric acid at its plant recently placed on stream here. The new products are synthesized in the plant's special products unit. The process is the first of its kind, involving a one-step oxidation of natural-gas components to acetic, propionic, and butyric acids, and other chemicals yet to be announced.

The two new commercial products from Pampa offer useful modifications of cellulose plastics, according to Celanese. Other uses include surface coatings, lacquers, flavors, and pharmaceuticals.

New Lion Chemical Plant To Go on Stream in 1954

EL DORADO, Ark. — The Barton chemical plant of Lion Oil Co., under construction near New Orleans, is not expected to go on stream until the second quarter of 1954, according to T. M. Martin, president.

The $31,000,000 installation will use natural gas, air, and water as raw materials to synthesize 300 tons of anhydrous ammonia per day. Largest portion of the ammonia will be further synthesized to pelleted ammonium nitrate.

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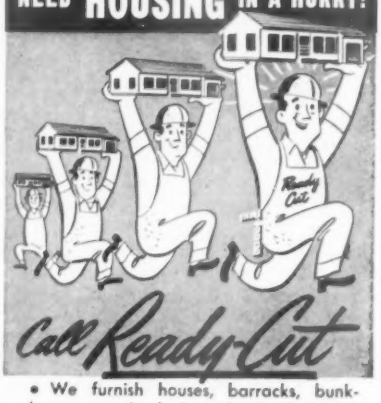

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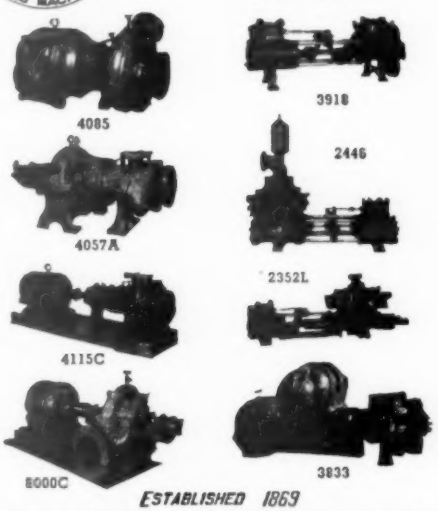

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EXPLORATION

Springer Search Still Spreading

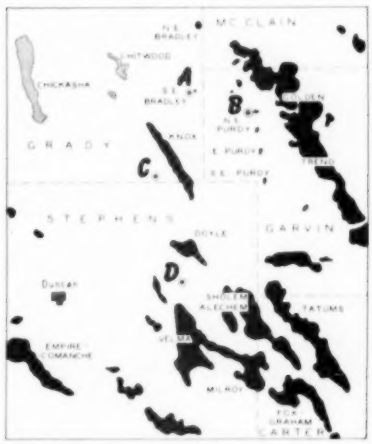
by Philip C. Ingalls

THE Springer sands, which have been the primary objective of most of the drilling activity in the Ardmore basin of Oklahoma during the past few years, are now being sought with increasing boldness throughout the southeastern tip of the Anadarko basin.

In the Ardmore basin, the Springer sands (five, possibly six, in number) have been found productive in steeply dipping strata on the flanks of the Velma, Milroy, Fox-Graham, Sholem Alechem, and Doyle structures from which the Springer formation was cut away during the post lower Dornick Hills erosional period. No Springer is found southwest of the big Velma structure, indicating that this structure formed a portion of a hinge line during the period of erosion which followed the deposition of the lower Dornick Hills on the Springer.

Northward, into the southeastern tip of the Anadarko basin, the Springer formation is believed to reach a thickness of about 3,000 ft. at the basin's axis, and then is known to thin to a wedge edge at the Golden Trend. The sands of the Springer, apparently restricted to the upper portion of the dominantly black shale formation, wedge out by truncation a short distance to the east and northeast of the three Purdy pools, Southeast Bradley, and Chitwood. The Springer extends on west and northwestward in the Anadarko basin, but, except for small production along the Wichita Mountain front, has yet to be found productive west of the Chickasha-Cement area where gas and condensate are produced from Springer sands. (The Springer was topped at 16,418 ft. in Superior Oil Co.'s deep test on the Fort Cobb anticline in Caddo County, about 25 miles northwest of Chickasha.)

Though it is still true that nearly every Springer-bound well is a wildcat, the high rank-wildcat interest in the Springer is shifting north out of the Ardmore basin. Deeper drilling is developing prolific gas production in the Springer at Chickasha gas field and gas-condensate at Chitwood. Two comparatively small Springer producers have been completed at Southeast Bradley. Immediately to the west of the Golden



South-Central Oklahoma area of high Springer interest.

Trend, Springer production is being developed at three Purdy pools. There have been five Springer wells completed at Northeast Purdy, eight at East Purdy, and two at Southeast Purdy. Springer production has also been developed on the west flank of the big Knox structure.

Just to the west of the two small Springer producers at Southeast Bradley, Magnolia Petroleum Co. 1 Howell-Gregg, NW SE 14-4n-5w, A on map, found the Springer several hundred feet higher than in the wells to the east and has tested upper sand intervals between 9,000 and 10,000 ft. for substantial recoveries of oil on drill-stem tests. This well is scheduled to test the Simpson.

A Springer test just to the west of a cluster of Deese producers, Cities Service Oil Co. and Superior Oil Co. 1 Hughes "B," NW SE 27-4n-4w, B on map, flowed gas and distillate from the Hart (fourth Deese); and in the Springer, at 8,347-9,033 ft., flowed 1,006 bbl. of 38.5°-gravity oil in 19 hours through a ¾-in. choke.

Helmerich & Payne 1 Harrison, NE SE 31-3n-5w, C on map, is starting a test to check the Springer off the southwest flank of the Knox structure. This well is aimed to pick up much more Springer section than has as yet been found at Knox, where, due to truncation, only the lowermost Springer sand is present. This bold stepout was made on the basis of excellent seismic data which indicated essentially unbroken dip to the southwest except for a minor fault on the structure side of the location.

Another rank wildcat in the more northern Springer area is Vickers Petroleum Co. and Eason Oil Co. Burkhart, NE SE 27-1n-5w, D on map, an old dry hole at total depth of 8,005 ft., which is to be drilled deeper to test the lowermost Springer sand.

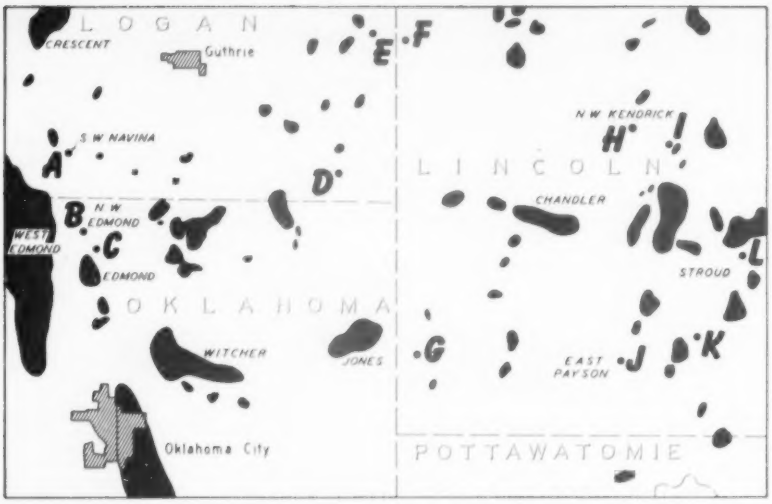
It is in this area that one of Oklahoma's greatest "future provinces" appears virtually assured.

HIGHLIGHTS OF WEEK'S DEVELOPMENTS

COLORADO . . . Another Permian discovery for the Denver-Julesburg basin has been indicated by saturation in cores of the Lyons sand at William R. Whittaker 1 Klausner, 34-1n-62w, southern Weld County. The apparent discovery is nearly 50 miles south of the first pre-Cretaceous production in the basin.

WEST TEXAS . . . Texas Gulf Producing Co. 2 Headlee, second well in the new Ellenburger pool of northeast Ector County, completed lower in the formation than the discovery, rated 644 bbl. of oil daily on potential.

TEXAS GULF COAST . . . Indications have been given of Woodbine production in the Fort Trinidad field, on the Houston-Madison county line, where Woodley Petroleum Co. and Moran Corp. 2 Bruton, in a 21-minute drill-stem test at 8,605½-21½ ft. in the lower part of the Woodbine sand recovered 4,500 ft. of 39°-gravity oil.



Map showing location of pools and interesting tests in the Logan-Oklahoma-Lincoln counties section of Oklahoma discussed in text.

NEW LIFE IN OLD REGION

Tricounty Area in Oklahoma Scores Dozen New Discoveries

by John C. McCaslin

ONE of Oklahoma's most active development and wildcatting areas is the Logan-Oklahoma-Lincoln counties section in the central part of the state.

This portion of Oklahoma, which has scored 12 new discoveries this year, is an old producing area, containing two of the state's best known oil fields, Oklahoma City and West Edmond. The three-county area is bordered on the west by the Nemaha granite ridge, a buried mountain range closely related in age and mechanics of structure to the Arbuckle Mountains of southern Oklahoma, which culminates southward in the Oklahoma City structure. The Oklahoma City structure is connected to the Pauls Valley uplift (northern Arbuckles) by an extensive plateau which separates the Anadarko and McAlester basins.

To the east of the Nemaha Ridge is the Central Oklahoma platform which runs north from the Pauls Valley uplift to the Kansas border. This platform is the primary geologic feature of Lincoln County, one of Oklahoma's most heavily drilled areas.

Nemaha ridge area . . . This general area in Logan and Oklahoma counties has experienced a number of leasing and drilling campaigns over a period of years. Although the fields have been very prolific, the structural complexities characteristic of these anticlines have resulted in a large number of dry holes.

Nemaha-ridge structures, although disconnected, are similar in shape and geologic history, and have been among the most prolific oil producers in the Mid-Continent area. Production records show the Wilcox sand is capable of producing from 600 to 1,000 bbl. per acre foot.

Two recent additions to the narrow Nemaha ridge area are Southwest Navina (A on map) and Northwest Edmond (B on map).

Northwest Edmond pool was opened early this year at Calvert Drilling Co. and Huffman & Malloy et al. 1 Salisbury. The gas-distillate discovery, located 4 miles north of the city of Edmond, produces from the second Wilcox and Simpson dolomite of Ordovician age. The third well has been completed in this new field.

Southwest Navina pool was opened last winter in the heart of a dry-hole area of Logan County by Macmillan Petroleum Corp. at 1 Krout, about midway between Crescent and Edmond fields. Initial production was 315 bbl. of oil per day from the second Wilcox. This discovery well also flowed 15,000 M.c.f. of gas daily with some distillate from the Simpson dolomite. Testing is still in progress at the confirmation well where a smaller rig has been moved in to test the Marshall zone, Simpson dolomite, and the Pennsylvanian Layton sand. The second Wilcox yielded only salt water in this well. Macmillan is drilling on a third well in the field area and has made location for a fourth.

The Southwest Navina discovery well drilled from Pennsylvanian strata into Sylvan shale to establish the presence of a sharp elongate faulted anticline, similar to the Crescent anticline 6 miles to the north, which has produced 23,500,000 bbl. of oil since its discovery in 1935, and is still producing about 600 bbl. per day.

Other Logan-Oklahoma activity . . . At D on map, Jordan Petroleum Co. has a new second Wilcox oil pool in the southeastern corner of Logan County. The test is 2 miles south and 1 mile east of Evansville. This discovery flowed 18 bbl. of oil per hour, opening Southeast Evansville pool.

Walter Duncan is completing 1 Jackson, 35-15n-14w, east of West Edmond field, as a possible discovery in the Prue at 6,254-80 ft.

Completion preparations are under way at an offset to a successful outpost test in Oklahoma County at Mohawk Drilling Co. 1 Price. A drill-stem test in the Simpson at 6,459-81 ft. flowed gas in 50 minutes and recovery was 220 ft. of free oil. This well is a south 40-acre offset to Mohawk 1 Bernstein, completed in October 1952 on the pump. This stepout was drilled about ½ mile west of the discovery well of Northwest Higbee pool (C on map).

A good Hunton lime well is completing in South Central School pool in Logan County at Thomas N. Berry Co. and Zephyr Petroleum Co. 1 Ricketts (E on map). The well yielded 3 bbl. of oil per hour while crews swabbed through the casing for 15 hours. This well, with open-hole production, is located just southeast of the field's discovery well, which is a first Wilcox sand strike.

Lincoln County area . . . The current hot spot on the Central Oklahoma platform is Lincoln County's Northwest Kendrick pool in the north-central part of the county (H on map). The pool, which was opened in January at W. A. Barton 1 Hartwell, flowing 180 bbl. of oil per day from the Prue sand, is rapidly being extended in all directions. Five new wells have been added to the area recently.

Lincoln County is one of the older producing areas of Oklahoma, but is still leading the state in amount of wildcatting and number of new discoveries.

Five new discoveries have been recorded this year. Among the more important discoveries of 1952 is this year's most active development spot in Oklahoma. That discovery is East Payson field in the southern part of Lincoln County, opened by Gulf Oil Corp. with production from the lower Skinner sand at about 4,100 ft. (J on map). There are more than 50 producing oil wells in the rapidly expanding pool. The state daily allowable for the Skinner sand (Pennsylvanian) pool is 5,000 bbl. Only one dry hole has been drilled in the new pool to date.

Stroud area . . . The old Stroud (Sac and Fox) pool (L on map) in eastern Lincoln County was revived this spring with a number of good-flowing Prue (Pennsylvanian) sand oil wells.

Production in the old producing area was established largely during 1938-39. Wilcox Oil Co. is producing a waterflooded unit of about 1,470 acres, containing 119 wells in this area. Water injection of the Prue sand has increased production about 100 per cent, according to company estimates.

Other Lincoln activity . . . A new Skinner sand pool and a Hunton lime discovery are assured Lincoln County.

The latest Skinner discovery in Lincoln, Mitchell-Gage Drilling Co. and William T. Singley 1 Thompson, in the southwest part of the county (G on map), swabbed 60 bbl. of oil per day natural. The pool opener will be treated by fracture method.

The Hunton lime discovery is located in the northwestern corner of the county at W. H. Margan 1 Orner (F on map). The prospective pool opener flowed 89 bbl. of oil per day and testing is still under way.

The extensive exploratory work now in progress in the Stroud area in the east central part of Lincoln has a new wildcat added to the play. Just south of the city McElreath, Harvey & Wagner will drill a 4,500-ft. Wilcox sand test 1 mile north of Stroud field production. A second Wilcox test is due the area 2 miles northeast of Stroud at Puckett Drilling Co.'s location.

A new Prue sand oil pool has been opened in Lincoln at Mohawk Drilling Co. 1 Anness estate (K on map). The discovery flowed 8,000 M.c.f. of gas per day plus 2 bbl. of distillate per hour on official gage. This new pool is located about 2 miles northeast of Wilzetta pool.

Mid-Continent Petroleum Corp. has completed an Oswego lime well in the new pool just north of Kendrick (I on map). The well flowed 150 bbl. of oil per day. The well is the south offset to the discovery well of the new pool. The same company has another operation under way in the area, and Sun Oil Co. is testing at still another well.

On the southwest side of the new Kendrick pool, Sun Oil Co. 3 Inman flowed 438 bbl. of oil in 18 hours on a ¾-in. choke from perforations at 3,352-56 ft. and 3,322-38 ft. in the Oswego lime logged at 3,312-56 ft. Sun is preparing to drill 4 Inman in NW NW NE 9-15n-5e.

History

Lincoln, Oklahoma, and Logan counties have been actively prospected for more than 30 years. Commercial production was first developed in Lincoln County in the fall of 1923 when Stroud field was opened by Union Petroleum & Supply Co. This county, due to its proximity to the big Cushing field, was thoroughly mapped by surface geologists in the early days of Oklahoma's oil history.

The continued strength of the area after more than 30 years of active prospecting is attributable to the existence of many prolific producing sands and the complexities of their traps.

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Organized Scouting Observes Its Thirtieth Anniversary

.....But scouting started with the first oil, having its origin in the roots of competition

by Carl Hoot

NEXT week, June 17-20 in Fort Worth, marks the thirtieth anniversary of the National Oil Scouts and Landmen's Association.

Scouting, however, is as old as the industry, having started with the first commercial oil discovery in Pennsylvania. It is said that companies then employed men to watch their competitors, for the limited outlet for oil at the time made it necessary to know who was bringing more oil to market, how much and where. No doubt they did some super sleuthing.

Swapping of information probably grew out of necessity, and unknown to their employers, because distances and the rapidly growing industry was a handicap to the scout. He had to trade information or lose out in his own game.

Scouting is now a cooperative affair, open and above-board for the general good of the oil industry. Scout reports are the backbone of the exchanges of information which results in more oil for every one. Scouting sparks competition and speeds action.

Competition still keen . . . The highly developed cooperation between scouts in an area and the weekly exchange of drilling, lease, and seismic dope, does not mean that all companies know all things necessary to their best interests. The scout today is still the rugged individual that his predecessor was, and his personal initiative above and beyond duties of the weekly check-meet materially affects his company's success in meeting or beating competition.

Scout requirements . . . Most companies seek college-trained men as applicants for scouts and some require a geological background. At any rate he must possess enough technical knowledge to quickly understand today's test-procedures and drilling practices.

High on the list is the ability to meet strangers easily and to listen effortlessly. He must be able to speak the driller's language, to understand the geologist sitting on a well, and report on his findings in an intelligent manner.

Seismic scouting . . . A few years ago companies had to scout seismic field operations. The process was simple, or so it appeared. All the scout had to do was to show up at the scene of the shooting party and report back on locations. How the scout knows where to catch a shooting crew is a trade secret they still hold, but party chiefs of seismic crews have related how they waited until a Sunday morning before shooting a particularly important or secret location, only to find the scout waiting for them when they reached the spot around 4 a.m.

Their uninvited guest was not entirely unwelcome. He furnished news of other crews in the area, and in some cases was the only one who knew where the crew was moving for their next job.

Facts and figures . . . The dollar expense of scouting an area is considerable, but keeping abreast of competition is always so. It is estimated that to maintain a full-time scout, the expense including overhead, will approximate $1,500 per month, and his trading or cooperative time is usually 3 days a week. It appears high but through the swapping of information with as many as 25 other scouts from adjoining areas, the days returned amount to 75 per week, not 3.

That is supposing the scout employs himself only gathering and receiving information. Actually he combs his area, rounding up pertinent facts while they are new, to keep his company up to date on big and little deals made, and in the making.

The oil scout generally is not thought of as part of the industry's technical and operating division, but the wealth of information collected and filed by an efficient scout department is a prime source of working material for the production engineering department. This applies to old areas as well as new. Companies participating in an area readily make available such material to each other so that every particle of known information can be assembled and had for the asking.

Furthermore, information compiled by scouting an area will remain so long as file records are kept, while operators come and go and in most cases if their working area has not been scouted, their records pass out of existence with them. Drilling data from scouting departments could help prevent the drilling of unnecessary dry holes in previously tested areas, point the way to favorable locations, or reveal important oil shows recorded while drilling. Such data are all-important to the operator who desires to work over or redrill an old well, in addition to furnishing a background for the wildcat driller.

The chief scout today has shed much of the public relations duties he formerly had, but his door is always open to the reporter, the consultant, production engineer, geologist, or to the many little people in the oil business who need a big helping hand in the way of data from his files.

Deep Springer Test

Parker Drilling Co. rig at Magnolia Petroleum Co. 1 Howell-Gregg, NW SE 14-4n-5w, Grady County, Oklahoma, now drilling below 10,500 ft. in the Springer section which has already indicated substantial production on drill-stem tests. This well is scheduled to go to 13,000 ft. (See roundup on Springer production, page 163, this issue.)

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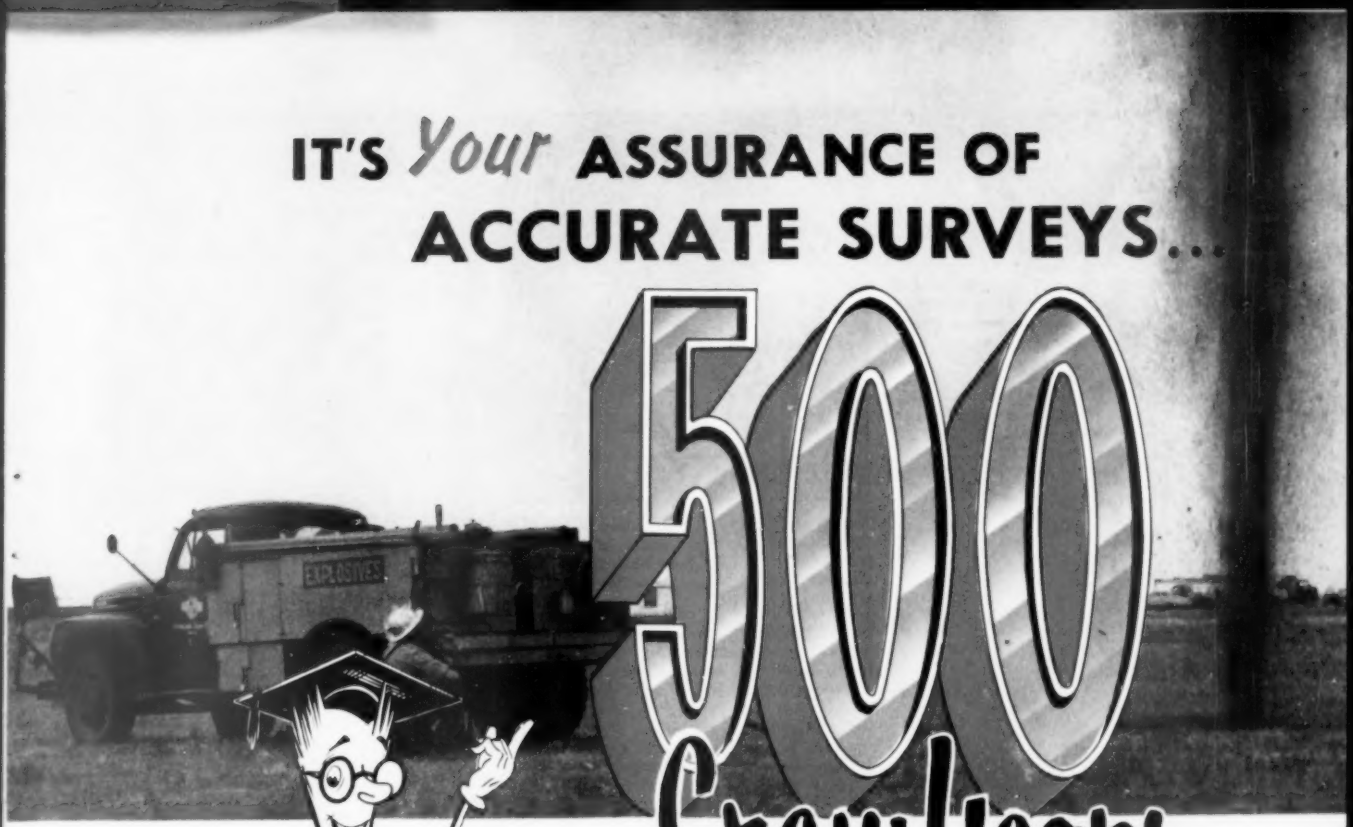

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TEXAS

WEST TEXAS

Phillips Tests Third Well at Glenna

Phillips Petroleum Co. 1-C Puckett, northwest outpost to Glenna pool in Pecos County, was drilled to 14,924 ft., in the pre-Cambrian then plugged back to 14,818 ft. to test the Ellenburger.

Initial perforations from 14,704-14,794 ft. developed a flow of 11,160,000 cu. ft. daily on 1-in. choke, and 10,720,000 cu. ft. when reduced to ½-in. Flowing pressure was 1,755 psi. Additional shots were placed between 14,460-14,5775 ft. and 14,254-14,380 ft. for further testing.

Payton Wildcat Resumes Testing

Cities Production Corp. 1 B. R. Payton, Devonian discovery in the shallow Payton field, has resumed testing of the high-pressure gas zone encountered last January, when it blew out of control and set a record of near 300,000,000 cu. ft. daily.

First drill-stem test at 6,768-6,800 ft. was 32 ft. into Devonian chert, and gas flow of 5,000,000 cu. ft. in 2 hours through ¼-in. choke indicated a record-size gas well was still a possibility. Flowing surface pressure was 2,200 psi. and distillate yield on the 2-hour test was 125 bbl. of 57° oil.

Details were not in on a second drill-stem test, after deepening, but apparently the drill had penetrated the gas-bearing zone.

The block of acreage on which this important discovery is located is jointly owned by Cities Service, Sun Oil Co., Peerless Oil & Gas Co., Atlantic Refining Co., British American Oil Producing Co., Stanolind Oil & Gas Co. and Texas Pacific Coal & Oil Co.

Geological location of the discovery is on the southwestern rim of the Central basin platform fields, and subsurface formations there rise up into a knob, so that while the well is stratigraphically deep, the drill goes into pre-Permian at a relatively shallow depth.

Headlee confirmation . . . Texas Gulf Producing Co. 2 Headlee, northeast offset to the discovery, completed from Ellenburger pay at 13,380-13,410 ft. for a flowing potential of 644 bbl. of oil daily. Coke size was 14/64-in.

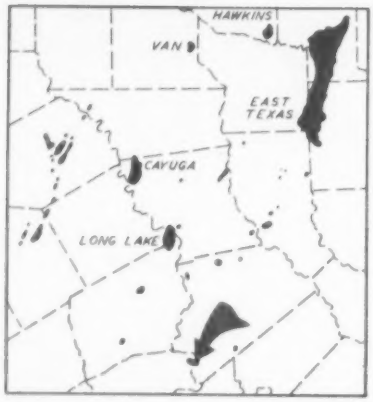
Upton discovery . . . The Texas Co. 1 Josephine Graf, Ellenburger failure, plugged back and completed as a Strawn discovery from perforations at 9,828-43 ft. On a 9-hour completion test, the well gaged 204 bbl. of 59° oil, plus 6,600,000 cu. ft. of gas, on 20/64-in. choke. Flowing tubing pressure was 2,250 psi.

TEXAS GULF COAST

Woodbine Production at Fort Trinidad Indicated

Indications of Woodbine production in the Fort Trinidad field, on the Houston-Madison county line, have been given in a well being drilled by Woodley Petroleum Co. and the Moran Corp. The well, 2 Bruton, in a drill-stem test of what is believed to be the Dexter member of the lower Woodbine filled 4,500 ft. of 39°-gravity oil in the 21 minutes the tester was open.

The test was made of 16 ft. of saturation encountered at 8,605½-21½ ft. There was an immediate strong blow when the tool was opened. Bottom-hole pressure at the end of the test was 3,227 psi. This built up to 3,870 psi. within 10 minutes after the tester was closed. Hole is being cored ahead, and may be carried to its original objective of 10,000 ft.



Portion of East Central Texas and inland Gulf Coast counties showing location of Fort Trinidad field, where new Woodbine production is indicated, and other Woodbine-producing fields.

If production is established in the Woodbine sand in this field, it will be the furtherest coastward such production has been found. Present production in the Fort Trinidad field, discovered in 1951, is from the deeper Buda lime and Georgetown lime. The field also is the furtherest coastward in which production from these horizons has been found.

The Woodley and Moran well is located in the Barton Clark Survey, on the Houston County side of the field.

Sohio Opens New Gas Area

Sohio Petroleum Co. has opened a new gas-producing area approximately 1½ miles northwest of the Quinn field, in Liberty County. Its discovery well, 1 Grogan, located in the Ed B. Jackson Survey, flowed at the rate of 28,750,000 cu. ft. of gas per day during final completion tests. Production is from casing perforations at 6,057-59 ft. Total depth is 7,512 ft.

Katy Field Extended

Production of the Katy field, located at the junction of Harris, Waller, and Fort Bend counties, has been extended another ¾ mile eastward in Harris County with the completion by Lee Brothers Oil Co. of its 1 Peek. The extension well, in the H&TC Survey, Section 66, flowed 36 bbl. of condensate with 2,300,000 cu. ft. of gas per day through 14/64-in. choke from casing perforations at 7,110-15 ft.

OKLAHOMA

New Kendrick Producer Gets Prolific Oil Flow

Sun Oil Co. has an exceptionally good well for the Kendrick area in Lincoln County at its 3 Inman. The well flowed 438 bbl. of clean oil on an 18-hour gage through ¾-in. choke. This was at an average rate of approximately 24⅓ bbl. per hour. Production is from Oswego lime with casing perforated in two zones, one at 3,322-38 ft. and the other at 3,352-56 ft. Total depth is 3,407 ft. with casing at 3,384 ft. The well kicked off after the swab had been run only twice. Location, in the NE NW NE 9-15n-5e, is on the southwest side of the field. Rig has been moved a location to the west for 4 Inman.

New Panhandle Wildcat

The active exploration which has been going on in Beaver County, in the Panhandle, the past year and a half has been given another boost with the starting of a deep wildcat test by Sun Oil Co. on its large block in the southwestern part of the county. The test, 1 Carter-Haywood, is located in the C NE NE 4-1n-21eCM, about 6 miles southwest of Carter Oil Co.'s Flores field, nearest production, opened early in 1952. Hole is projected to 8,500 ft. No other tests have been drilled in the area.

CALIFORNIA

Oil Found Offshore In Ventura County

Standard of California is preparing to complete its C-1 State on its "tidelands" lease at Montalvo, Ventura County. The well has been slant-drilled from an upland location and is bottomed offshore at 12,543 ft. Standard has erected tanks and is grading location for its second well on the lease, lending color to reports that the company expects a well of sufficient size to warrant continued drilling despite the depth of the pay.

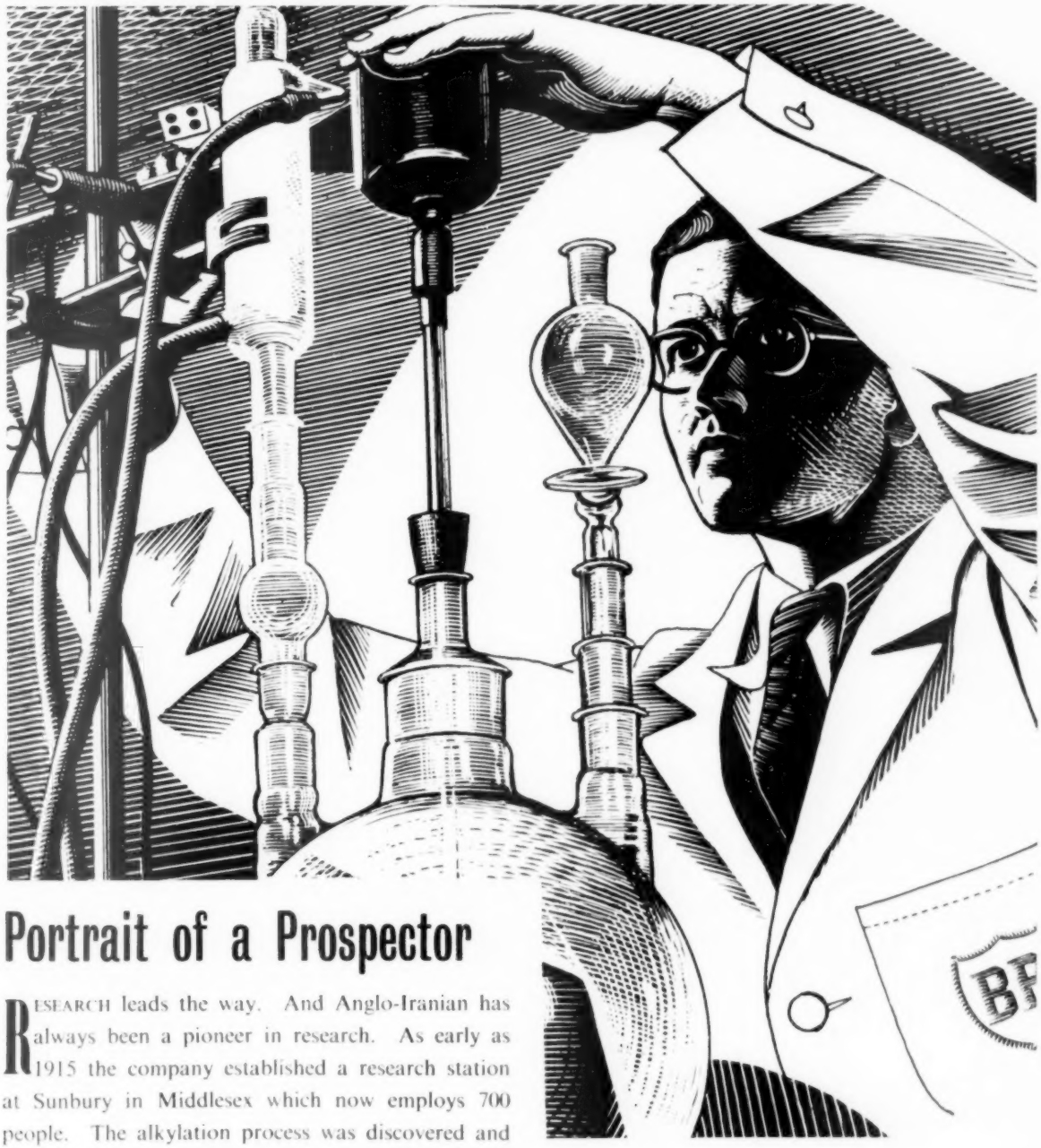
Throughout the long submerged lands controversy, the state lands commission has been required to ask for bids on submerged lands along the coast where it could be shown that oil under these submerged lands was being drained by a well on private property on the upland. Drainage in this case was shown to exist as the result of a discovery some 2 years ago by Standard on its McGrath lease in a well located about 500 ft. landward. The discovery well, 148-12 McGrath in 26-2n-23w, came in for 238 bbl. a day of 19.7°-gravity clean oil through a 74/64-in. choke from an interval in the Sespe formation at 11,810-21 ft. This pool underlying the already-existing McGrath pool in Montalvo field, was named Colonia. The well about to be completed is the first to be drilled to this pool since the discovery.

Shows Reported in San Fernando Wildcat

A second oil discovery in the San Fernando Valley within a fortnight is believed likely as a result of showings reported in the 52-15 Greenman Community wildcat drilled by Porter Sesnon, Barbara Sesnon Cartan, and William T. Sesnon in 15-2n-16w, 3½ miles south of Aliso Canyon oil field in Los Angeles County. On a formation test of the interval 5,261-5,302 ft., about 430 ft. of net fluid was recovered of which 138 ft. was 30°-gravity oil. Drilling is continuing below 5,380 ft. in shale. Standard of California made a discovery of 24°-gravity oil in Section 2, about 2½ miles to the northeast, about 10 days ago.

Wheeler Ridge Eocene Offset Is Completed

Richfield Oil Corp. has completed its northwest offset to its Eocene discovery well of last year in Wheeler Ridge field in Kern



Portrait of a Prospector

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County. The well is 74-29 K.C.L. in 29-11n-20w and, as reported a month ago, is also the discovery well of a third producing zone overlying the deeper Eocene sand. However, Richfield elected not to produce the well from the new zone but to complete it in the Eocene. With tubing set at 9,861 ft., initial production was 407 bbl. daily of clean 35.6°-gravity oil through a 10/64-in. choke.

The third zone, yet to be produced, is highly regarded in view of a formation test of the interval 9,584-9,660 ft. which resulted in a flow of 51°-gravity condensate and 12,040 M.c.f. daily through a ⅛-in. choke. The sand was identified as Refugian of Oligocene age.

LOUISIANA

SOUTH LOUISIANA

Second Well Confirms Discovery at Florence

Recent discovery by Austral Oil & Exploration Co. of gas-condensate production in the Florence area of Vermilion Parish is being confirmed by Tide Water Associated Oil Co. at its 1-B State, second well for the area.

The Tide Water well, ½ mile north of the discovery well, flowed an ungaged volume of gas and condensate on initial completion tests, and is virtually assured of a successful completion. Flowing pressure through ¾-in. and ⅛-in. chokes gaged 3,100 psi. Pay sand is open through casing perforations at 11,825-28 ft. Hole was drilled to 11,987 ft. and has casing to bottom.

Austral's well produces from a casing-perforated interval at 11,795-802 ft. It flowed 88 bbl. of 47.4°-gravity condensate with 4,400,000 cu. ft. of gas per day through ¾-in. choke.

Another Gas Reservoir Found in Breton Sound

Kerr-McGee Oil Industries, Inc., has uncovered another gas reservoir in its extensive exploration operations being carried on in offshore waters of Breton Sound, Plaquemines Parish. The discovery, the company's second in the area, is at I-F State Lease 1237, in Block 45. The well flowed 3,260,000 cu. ft. of gas daily in completion tests through 20/64-in. choke. Sand is open through casing perforations at 3,841-46 ft.

Location is about 2 miles southwest of the company's first discovery at I-E State Lease 1230, completed in sands at 4,888-93 ft. and 4,505-12 ft. The company already has drilled more than 30 core tests to depths of approximately 3,200 ft. in its exploration program.

NORTH LOUISIANA

Buck Bayou Confirmation Test Has Been Delayed

A confirmation test of Buck Bayou field in East-Central Louisiana's Concordia Parish has been staked but operations have been delayed by high water.

The well, Hunt Oil Co. 2 John Dale, Jr. is an east offset to the discovery. It is located 625 ft. from the south line and 660 ft. from the west line of 6-6n-8e. All Wilcox sands productive in this area are scheduled to be tested by this projected 6,500-ft. test.

Buck Bayou field was discovered early in

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TIGER LOOSE

IN KANSAS

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WESTPORT, CONNECTICUT

May by Billups Brothers and Vasser & Brown, Inc. 1 B. D. King et al. The discovery, located 625 ft. from the south line and 660 ft. from the east line of 1-6n-7e, was completed flowing 163 bbl. of 39.1°-gravity oil daily through a 9/64-in choke from Wilcox perforations at 5,310-15 ft. The successful wildcat found 14 ft. of net effective oil sand at 5,310-24 ft. and no water was indicated by production tests.

Springhill Extended

John B. Stephens, Jr., and A. O. Phillips 1 W. A. Griffin has been completed pumping 118 bbl. of 37°-gravity oil and 5 per cent basic sediment and water daily from open hole in the Tokio at 3,144-48 ft. The well, located 1 mile southwest of other Tokio production in northern Webster Parish's Springhill field, is in the NW SE SW of irregular section 2-23n-11w.

At the same operators' 2 Griffin, a south offset in SW SE SW 2-23n-11w, the Tokio sand was found in the same interval productive in the new field extension well. Now drilling below 5,400 ft., this well is scheduled to test the Pettit.

KENTUCKY

EASTERN KENTUCKY

In the Pike County sector of Big Sandy Gas field and located on Beef Hide Creek, Kentucky-West Virginia Gas Co. has completed 6096 N.D.L. Greer for an open flow potential of 273,000 cu. ft. of gas daily. Producing horizon is the Devonian brown shale topped at 3,320 ft. and bottomed at a total depth of 3,565 ft. Producing zones were shot with 6,900 pounds of gelatin.

In the southern extension to Big Sandy Gas field and located on Rock House Creek of Letcher County, Kentucky-West Virginia Gas Co. has completed another gasser in this area at 6108 James H. Collins. Well is producing from Devonian brown shale at a depth of 3,441 ft. after topping formation at 3,000 ft. Well showed initially for 60,000 cu. ft. of gas daily which increased to 381,000 cu. ft. daily after shooting with 4,500 pounds of gelatin.

ARKANSAS

Swab Smackover Strike

Leonard W. Phillips 1 Clemmie M. Bishop, NE SE 25-16s-17w, was swabbing into production. This wildcat, located about 2½ miles northeast of the town of Lisbon, recovered 2,500 ft. of oil and 1,000 ft. of water cushion on a 70-minute drill-stem test of the Smackover at 6,397-6,403 ft. Casing is set near the top of the Smackover at 6,396 ft. Cotton Valley production was indicated in this well by a drill-stem test up the hole.

Flowing Well at Hibank

Hibank field of Union County got its fifteenth oil well with the completion of McAlester Fuel Co. A-9 H. G. Pendleton, SW SE NE 23-18s-15w. The well came in flowing 157 bbl. of oil in 13 hours from Meakin sand perforations at 2,506-08 ft. through a ¼-in. choke.

Another Tuscaloosa well for the field appears assured at McAlester A-4 H. B. Grace, just one 10-acre location to the north of A-9 Pendleton. This apparent well flowed gas and oil to pits on a 30-minute test of the Tuscaloosa at 3,055-67 ft.

Hibank field's 15 wells produce from the Graves and Hogg sands as well as the Meakin and Tuscaloosa.

KANSAS

Marmaton Shows Tested In Ellis County Wildcat

Testing is under way at an indicated Marmaton discovery in western Ellis County, on the west flank of the Central Kansas Uplift. The prospective discovery well, drilled by Braden Drilling Co. at 1 Gerkin, located in the SW SW SW 13-13s-20w, topped Marmaton sand at 3,842 ft. (surface elevation 2,169 ft.), and in a drill-stem test at 3,843-51 ft., recovered 300 ft. of oil and muddy oil. A previous test at 3,792-3,819 ft. in Marmaton chert got 1,320 ft. of oil and gas-cut mud and water.

Since these tests, hole has been drilled to 3,900 ft. and has casing run to 3,899 ft. The well had the Lansing at 3,508 ft., but this zone showed only a trace of oil. Location is about 2½ miles northeast of the Pleasant Northwest pool.

Ellis County has another indicated oil discovery about 6 miles northwest of the Braden well where National Cooperative Refinery Association swabbed 55 bbl. of oil in 6 hours at its 1 Erbert with Lansing lime as the pay zone. This well, now being put on the pump for completion, logged the Lansing at 3,541 ft. (surface elevation 2,248 ft.), and is open through casing perforations at 3,727-34 ft. It was drilled to 3,928 ft. in Arbuckle lime, topped at 3,906 ft. Location is in the NW NW NW 20-12s-20w.

NEW MEXICO

SOUTHEAST NEW MEXICO

Sun Will Survey Before Running Production Tests

Sun Oil Co. 1 Harper-Federal, Delaware basin wildcat, had 5-in. casing set at 14,991 ft., 2 ft. off bottom, and was conditioning hole. Plans were to drill approximately 12 shot holes around the well and run velocity surveys before making production tests.

Deep well reports . . . Richardson & Bass 1 Fidel-Federal recovered sulfur water on drill-stem test between 12,722-12,892 ft. Recovery included 564 ft. of slightly gas-cut water blanket, 94 ft. of slightly gas-cut mud, 282 ft. of gas and water-cut mud and about 2,200 ft. of gas and mud-cut sulfur water. Operators were drilling ahead below 12,899 ft. in shale and sand.

Richardson & Bass 1 Cobb-Federal reported no shows in cores from 16,219-49 ft. and was coring ahead in dolomite from 16,278 ft.

Richardson & Bass 1 Harrison-Federal was in shale and lime at 14,144 ft.

Bronco field offset . . . Confirmation of the Bronco field as a multipay area was assured at Amerada Petroleum Corp. 1 Ward, northwest offset to a Devonian producer, and southwest of the pool opener.

Drill-stem test in the Wolfcamp from 9,417-9,640 ft. flowed 42 bbl. of oil in 1 hour after fluid reached the surface. Operators were drilling ahead. Main pay in the field is

the Siluro-Devonian and indicated pays include the Mississippian.

Devonian stepout . . . Texas Pacific Coal & Oil Co. 1 Lane Mill Unit, north of the Anderson Ranch Devonian discovery, recovered salt water on a drill-stem test from 13,590-13,655 ft., believed to be in the top of the Devonian.

CANADA

WESTERN CANADA

Four More Wildcat Discoveries Indicated

Four exploratory ventures in western Canada indicated discovery during the past week, including three that gave up crude oil and one natural gas strike. Two of the oil discoveries are in Saskatchewan, while Alberta accounted for the other oil find and a natural gas discovery.

One of the oil discoveries, a medium gravity strike in the Gull Lake area of southwest Saskatchewan, was made by the team of Anglo-American Exploration, Ltd., and Gridoil Freehold Leases, Ltd., 33 miles southwest of Swift Current. This is the teams second discovery in the region, and was made in the Blairmore sand. The first strike, in two zones of the Jurassic formation, was made last year. This new discovery well, 6-13 Gull Lake, LSD 6, 13-13-19w3, is 2 miles northeast of the Jurassic oil wells. A drill-stem test in the Blairmore interval 3,616-51 ft., flowed gas in 8 minutes at rate approximately 15,000 cu. ft. daily, decreasing to zero in 50 minutes. Pipe recovery was 1,178 ft. of 21°-gravity oil in 1 hour. The well is currently deepening for lower objectives, and is below 3,702 ft.

The other Saskatchewan oil discovery, heavy gravity crude (between 11° and 12° gravity) was made in the Battle Creek area, 48 miles south of Maple Creek. Backing the venture are Saskatchewan Federated Co-operatives, Ltd., Canada Southern Oils, Ltd., Imperial Oil, Ltd., and Calvan Consolidated Oil & Gas Co., Ltd.

The strike was made at the groups 1-27 Battle Creek on LSD 1, 27-3-26w3rd. The discovery test was run in the Mississippian interval 4,566-90 ft., and 1-hour recovery was 4,140 ft. of heavy black crude oil. Hole was taken down to 4,674 ft. and is being plugged back for further tests.

Alberta's oil find this week was made in the extreme southern sector of the province, near Del Bonita. Owners of this well include National Petroleum Corp., Ltd., Northland Oils Ltd., and Regency Oils, Ltd., all Calgary-based oil firms. The well, LSD 8, 7-1-21w4, is 45 miles south of Lethbridge and 1½ miles north of the Montana border. A drill-stem test in the basal section of the Mississippian, at 6,145-75 ft., gave up 900 ft. of 35°-gravity oil, no water. The significance of this strike is primarily that it is the first well to yield oil in indicated commercial volume from the lower section of the Mississippian. Other wells in the region have given up oil from the Mississippian, but approximately 1,000 ft. higher in the section. Hole is being carried down as a Devonian test.

The lone gas discovery this week was made at an Amerada Petroleum Corp. exploratory well in the Sturgeon Lake area of northwest Alberta, 190 miles northwest of Edmonton. This well, 32-13 VF, LSD 10, 13-70-25w5, is 12 miles southwest of Amerada's 1952 D^3 reef oil discovery well. The gas came from the Bluesky zone of the Lower Cretaceous, during test of interval 4,931-70 ft. Maximum gas flow rate was 10,600,000 cu. ft. daily. Well is now heading for its Devonian reef objective, and is below 5,817 ft.

Testing operations are being continued at the York-Pathfinder-Brooks Sunburst sand oil and gas discovery well, LSD 10, 18-19-14w4, 70 miles northeast of Lethbridge. Perforating and acidizing 18 ft. of the oil zone has been completed. Swabbing commenced and recovery has been approximately 4 bbl. of oil and spent acid hourly, with a negligible volume of gas. As soon as the zone has been cleaned of acid, the whole oil zone will be temporarily shut in and an attempt will be made to determine the gas potential before placing the well on production. The wildcat found about 23 ft. of gas zone above the indicated 52 ft. of water-free oil pay. Top of the Sunburst sand was found at 3,442 ft.

Production test operations will be carried out at Socony-Vacuum Exploration Co.'s wildcat in the Pembina area of central Alberta, 65 miles southwest of Edmonton and 45 miles west of Wizard Lake oil field. This exploratory venture, on farmout lands from Seaboard Oil Co. of Delaware, encountered some oil encouragement in the Cardium formation earlier this year. Following electro, micro and radio active logging, Socony decided to plug back, run pipe and test the Cardium, in an effort to determine whether the well will produce in commercial volume.

The encouraging wildcat is Socony 1 Pembina, LSD 4, 16-48-8w5. During March crew ran a 40-minute drill-stem test in Cardium interval 5,335-76 ft. Recovery was 110 ft. of heavily oil and gas-cut mud. Hole was taken down to 9,425 ft. preliminary to running logs and plugging back.

Geophysical activity . . . The most recent check on the number of geophysical crews operating in western Canada revealed a total of 151. Of this total, 142 units were seismograph, 8 gravimeter, and 1 magnetometer.

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Alberta dominated the geophysical activity with 11 seismic crews, 5 gravity crews, and the only magnetometer. In Saskatchewan there were 28 active seismic crews and 2 gravity crews. British Columbia had two seismograph crews and one gravimeter crew. Manitoba's geophysical activity was limited to one seismic crew.

Those companies carrying out the largest geophysical programs were as follows: Imperial Oil, Ltd., 21 seismic crews and 1 gravimeter; Canadian Gulf Oil Co., 12 seismic crews and 3 gravimeter; Shell Oil Co., 14 seismic crews; Socony-Vacuum Exploration Co., 11 seismograph and 2 gravimeters; and The California Standard Co., 9 seismographs.

EASTERN CANADA

Drilling in Enniskillen Township, Lambton County, in an area outlying Dawn storage field, Union Gas Co. has encountered a good well in an horizon approximating the Guelph-Niagara limestone. Production tests have not been completed.

APPALACHIAN AREA

OHIO

An area in the northwest part of Perry Township, Coshocton County, formerly condemned by dry holes, is now producing through the aid of sand fracturing. The Wray Drilling 3 Taylor, Section 6, was increased from a fair show of oil to 70 bbl. in 24 hours from Clinton sand found at 3,238-3,300 ft.

In Mt. Zion pool in Jackson Township, Knox County, Clinton Oil & Gas 14 Burch, Section 18, made 200 bbl. in 24 hours after fracturing sand, logged at 3,005-56 ft. Ray Penick 7 Harris, Section 23, made 100 bbl. daily from fractured sand at 3,061-3,107 ft.

Status Development Co. extended Sandyville field by a completion of 2 J. B. Norris, lot 31, Sandy Township, Stark County. Clinton at 4,926-50 ft. gaged 425,000 cu. ft. natural.

MICHIGAN

North Hamilton Extension Flows From Richfield

Sun Oil Co. is completing what appears to be the best Richfield oil well drilled to date in North Hamilton pool, Clare County, and at the same time this new well was extending the field a full 1½ miles to the northwest. The new North Hamilton field well was the Sun 1 Coskey et al, NW NW SW 36-20n-4w, Frost Township, which flowed 72 and 126 bbl. natural from Richfield pays logged from 5,220 to 5,326 ft. Over this 106-ft. pay section, a total of 22 ft. of pay was recorded, the most pay logged in any field well drilled to date. Well is to be acidized.

Sun Oil Co. also completed a natural flowing Dundee oil well on the north side of Cranberry Lake field, Winterfield Township, Clare County. This well is bound to attract more rigs to drill for this shallower pay zone in Cranberry Lake where most drilling now being done has the Richfield zone as its objective. The Sun 2 Randall et al, NW NE SW 1-20n-6w, was completed in the Dundee at 3,758 ft., total depth, with a natural production rating of 80 bbl. of oil, restricted flow. Actual gages indicated production of 160, 125, 170 and 97 bbl. of oil a day before choke arrangement was made restricting flow to approximately 80 bbl. Dundee top was logged at 3,752 ft. and pay section at 3,753-55

ft. No water was showing. This is the better of the two Dundee oilwells drilled in the Cranberry Lake pool during the current development program.

W. H. Strickler completed a Richfield oilwell in Cranberry Lake, at the 1 State-Winterfield, NW SW NW 12-20n-6w, which was rated good for 90 bbl. of oil a day following acid treatment with 3,000 gal. Well is being produced from 5,142 ft., total depth, and is a better-than-average Richfield oil producer in this pool.

ROCKY MOUNTAIN

COLORADO

New Denver-Julesburg Permian Strike Indicated

The first encouragement for Permian prospects in the Denver-Julesburg basin since the discovery of the basin's initial pre-Cretaceous production in the Keota area of Weld County earlier this year has materialized at the William R. Whittaker Co., Ltd., 1 Klausner, C NE SW 34-1n-62w, in the southern part of Weld County.

The well cored Lyons sand from 8,373 to 8,413 ft. and recovered good sand through the entire interval, with staining from 8,373-8,402 ft. The operator has attempted three drill-stem tests without success, and was last reported drilling out packer rubbers lost in hole.

The well is almost 50 miles south of Sherrod & Apperson's discovery well at 8 Gillette, C NW NW 9-9n-61w, which has been completed for a pump gage of 279 bbl. of oil daily from the Lyons. A confirmation effort southeast of this well has not yet reached testing stages.

A considerable drilling program to Permian was launched following the success in the Keota area. Prior to the show in 1 Klausner there had been no encouragement from the series. A wildcat in the Greasewood area about midway between the discovery and 1 Klausner was dry in the Lyons. At Continental Oil Co. 1 Perry, C SW NW, 13-9n-61w, east of the discovery the operator has tested water in Lyons. Farther east Glasscock & Sloss also recovered water on test of Lyons at 1 Bradbury, NW NE NW, 15-9n-58w. Both these wells will drill deeper to test the Big Blue which had non-commercial shows in the Keota discovery.

Commercial completion at 1 Klausner would open a wide area south of Keota and along the west side of the basin to further work to the Permian horizons. The interest in deeper possibilities is already expressed in Ginther-Warren-Ginther 2 Noonan Ranch, SW SE NW 24-3s-59w in Adams County, which is to test the Lyons after failure in Cretaceous sands, and is now drilling below 6,250 ft. This is the southernmost deep test in the basin.

Logan County Wildcats Near Completion

Logan County produced both an apparent oil discovery, and a gas discovery in the current week. Ryan Oil Co. and Miracle-Fifer tested 1,800 ft. of clean oil and 1,500 ft. of water in 2 hours from the zone 5,124-35½ ft. at 1 Olsen, SW SW SE 30-12n-52w. The operator reported a core containing 11 ft. of apparently productive "D" sand above indications of water. The well is to the north of existing Colorado production, and south of Southwest Potter field in Nebraska. The operator is setting casing with total depth at 5,323 ft.

Skelly Oil Co. recovered gas at the rate of 10 million cubic feet per day at 1 Svacina, SE SE SW 18-8n-54w, west of production in Yenter pool. Test was of the interval 5,404-20 ft. in "J" sand. Tool was open 1½ hours, and gas flowed at the surface after 1½ minutes. Flowing pressure was 304-820 psi., and shut-in pressure was 1,425 psi. A test above this interval from 5,385-5,404 ft. made gas at the rate of 4,250,000 cu. ft. per day. The operator is running casing with total depth at 5,450 ft.

UTAH

Carbon County Dakota Discovery Indicated

Three States Natural Gas Co. recovered gas at the rate of 1,780,000 cu. ft. per day from Dakota sand at 1 Kearns, SE NW NE 27-16s-6e, 17 miles south of Clear Creek field, in Carbon County. The well blew out, later made the rated flow on a short test, and was reportedly increasing in volume when shut in. The well marks the first apparently commercial recovery of gas from Dakota in the central Utah area. Production at Clear Creek field, operated by Three States is from Ferron sands.

Sample top of the Dakota was reported at 7,002 ft. and casing has been landed at 6,065 ft. with the well at 7,038 ft., total depth. Top of Ferron was logged at 5,066 ft., and the well made a small amount of gas on test of the zone 6,050-85 ft. The discovery of gas in Dakota in this area is of importance, since it opens the Wasatch Plateau for possible production from this horizon in addition to the sizable reserves already developed in Ferron sands at Clear Creek field.

SOUTH DAKOTA

Carter Skids to New Spot at Gallup Wildcat

Carter Oil Co. has abandoned attempts to redrill at 1 Hendricks, C SW NW 2-20n-3e, in the Gallup area of Harding County, and is skidding rig to a new location. The well reached 8,393 ft. in Ordovician and had recovered a pint of free oil when the hole caved. The operator will drill new hole to the Ordovician.

MONTANA

Big Producer Tested in Northwest Sumatra Area

Gulf Oil Co. has tested what is apparently the best producer to date in the Northwest Sumatra area of Rosebud County at 2 State, C SE NE 16-11n-32e. On test of the zone 4,800-21 ft. in lower Amsden the well had gas to the surface in 10 minutes and flowed at the rate of nearly 29 bbl. of oil per hour after 1 hour and 3 minutes. Core from 4,824-49 ft. recovered 24 ft. of which 23 ft. was saturated sand. About 2 feet of saturated sand was recovered in core from 4,849-65 ft. above sand with light stain and watery appearance. With the well at 4,865 ft., total depth, the operator is reported running further tests.

The area has been the most active in central Montana since the completion of The Texas Co. 1 Grebe, C NW NW 15-11n-32e,

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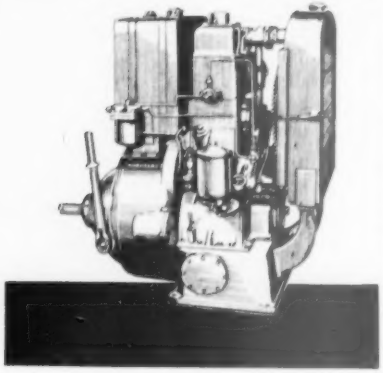

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in July 1952. The well, the pool opener, flowed 283 bbl. of oil daily from a sand in lower Amsden. Several of the completions in the field have been from more than one sand section, but with all of them apparently in lower Amsden. There are nine producers in the field and six failures completed since discovery. Most important of the wells now drilling is McAlester Fuel Co. 1 NPRR "C," lot 2, 7-11n-32e, 2½ miles northwest of nearest production. It is now reported below 3,450 ft. with Amsden expected at about 5,200 ft.

Cabin Creek Data Released

Shell Oil Co. has released official test data at its Cabin Creek unit discovery 22-33 unit, NW SE NW 33-10n-58e. Fallon County, confirming earlier reports that the well is the best initial producer so far drilled in the Williston basin. Ordovician perforations at 8,833-8,957 ft. were acidized with 2,000 gal. for an initial flow rate of 906 bbl. of oil daily. The zone 8,688-8,760 ft. was acidized with 1,500 gal. and swabbed at the rate of 346 bbl. daily. Perforations in Silurian from 8,267-8,535 ft. flowed 2,020 bbl. per day following acidization with 3,000 gal., with the rate increasing to 2,576 bbl. daily when re-acidized with 10,000 gal. Announced potential from all these zones was 4,253 bbl. per day.

Drill-stem tests in Madison and Devonian indicated commercial production on tests, but no attempt was made to test these zones after casing was run.

WYOMING

New Manderson Outpost Staked

The Pegasus division of Socony-Vacuum Oil Co. has staked location for F-41-4-G, C NE NE lot 5, 4-49n-92w, outside the Manderson unit in Big Horn County, about ¾ mile southeast of Gulf Oil Co.'s recent producer at 1 Thomas, NE SE 33-50n-92w. Gulf will suspend its proposed second test in the area at 1 Smith, C NE NW 34-50n-92w, and will contribute to the Socony-Vacuum test. The area has been one of the most interesting in the state in recent months, since development began, and two wells outside the unit area were successful. The Manderson discovery was made more than 1 year ago, but development was delayed pending unitization.

South of the Manderson unit, but of interest in the general program of exploration along the east side of the Big Horn basin, Stanolind Oil & Gas Co. has spudded the first test of the Cottonwood Creek unit in Washakie County. The wildcat is 1 unit, C SW SW 2-47n-91w. It will test the Phosphoria at about 8,500 ft. The unit is adjacent to Worland pool, and northeast of the South Frisby unit where Socony-Vacuum is now drilling a confirmation test to a discovery which dates from 1949.

MISSISSIPPI

MISSISSIPPI

Smackover Production in Mississippi Is Indicated

Mississippi came another step closer to getting its first commercial production from the Smackover formation with latest tests at Carter Oil Co.'s prospective discovery well, 1 Brown, southeast of Loring, in Madison County, getting a flow at the rate of 223 bbl. of condensate and 4,589,000 cu. ft. of gas per day. No water was indicated.

The flow was made through ⅜-in. bottom-hole choke and ⅝-in. top-hole choke. Fluid flow was calculated on the basis of a 5-hour gage, limited because of separator trouble which developed after that period. Gas flow was on the basis of a 17-hour gage. Top flowing pressure was 1,000 psi.

The test took in the entire open hole from bottom of the casing at 12,130 ft. to total depth at 12,487 ft. Additional tests are to be made taking in only the lower portion.

Successful completion of the well hinges on the provision of means for production of the gas, which has a high content of non-inflammable carbon dioxide and poisonous and corrosive hydrogen sulfide.

WILDCAT COMPLETIONS

SOUTHWEST TEXAS

Caldwell County: Hinton & Penick 1 Lockhart, Boyd Lockhart Sur. Dry. TD 775 ft.

Duval County: Argo Oil Corp. 1-A Murphy, BS&F Sur. 120. IP 5,000 M.c.f. daily, open flow, casing perforations 2,764-68 ft. (tubing completion), and shut-in dry gas, casing perforations 2,756-62 ft. (casing completion). TD 9,207 ft. (New field West Labbe.)

Leavitt Corning, Jr., and J. C. McCabe 1 Lucille Gray est., J. Pointevent Sur. 389, A-440. Dry. TD 2,932 ft.

La Gloria Corp. 2 Wolters, King & Hillje Subd., Garrett Ranch. Dry. TD 4,692 ft. (South Crestonia area.)

Harris S. Stahl 1 Houlihan et al, J. Poitevent Sur. 32. Dry. TD 3,680 ft.

Jim Hogg County: Humble Oil & Refining Co. 4-D Atwood, Las Cuevitas Grant. Dry. TD 3,600 ft.

Kenedy County: Sun Oil Co. 3 Dunn-McCampbell, J. S. Boyles Sur. IP 15,300 M.c.f. daily, open flow, Marginulina 7,300-14 ft. (casing perforations). TD 7,340 ft. (Extends Murdock Pass field.)

McMullen County: Alaska Steamship Co. and Newman Brothers Drilling Co. 4-G South Texas Syndicate, BS&F Sur. 9, A-102. Dry. TD 6,273 ft.

*Sunray Oil Corp. 1 Penn, AB&M Sur. 55, A-46. IP 26,000 M.c.f. daily with 15 BC per million, Carrizo 7,828-43 ft. (casing perforations). TD 10,200 ft.

Medina County: Eckert, Howell & McFarland 1 Howard, John George Sur. Dry. TD 1,710 ft.

Nueces County: F. W. Carr 1 Harris, Mary Luby Petronilla Subd. Dry. TD 8,432 ft.

Forrest Oil Corp. 1 Burnet, Driscoll Ranch. Dry. TD 7,303 ft.

Sun Oil Co. 1 Corpus Christi-State Tract 443, Corpus Christi Bay. IP 93.4 BOPD, 11/64-in., 37.2°, casing perforations 7,284-88 ft. TD 7,301 ft. (Extends Mustang Island field.)

San Patricio County: Heep Oil Corp. et al 1 Fee Unit, Burton & Danforth Subd. Dry. TD 8,550 ft.

Starr County: Owen & Moss 1-D S. B. Ricaby est., Porción 83. Dry. TD 1,850 ft.

Travis County: Grady Peeler 2 Alexander, Michael Green Sur. 4. Dry. TD 1,002 ft.

Webb County: J. C. McCabe et al 1 Moos, CCSD&RGNG Sur. 62. Dry. TD 4,340 ft.

The Texas Co. 14 Kirkpatrick, W. W. Griffin Sur. 58, A-226. Dry. TD 4,510 ft.

Wilson County: Maple C. Hughes 2 Scull, Manuel Ximines Sur., A-22. Dry. TD 3,241 ft.

Zapata County: Killam & Hurd 1-13 A. M. Bruni est., Block 11, Sur. 13. Dry. TD 1,830 ft.

Don H. Marsh et al 1-A Lopez, Mrs. S. C. Hendrick Sur. 288. Dry. TD 2,510 ft.

Another milestone...

THE NEW SCHLUMBERGER HEADQUARTERS

At the new Schlumberger headquarters on the Gulf Freeway in Houston, the instruments, trucks and equipment are built to provide the oil industry with 25 specialized services throughout the United States and Canada.

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WELL SURVEYING CORPORATION — HOUSTON

OPERATORS PREFER NEW, IMPROVED JELFLAKE® FOR LOST CIRCULATION CONTROL

Many Exclusive Advantages Account for Overwhelming Choice

It's no wonder Jelflake is preferred for more effective lost circulation control. These fragmented cellulose flakes fulfill practically every operator's needs.

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Jelflake is used to stop mud loss. Its graded particle sizes assure deep penetrating action as well as surface plastering of faulty formation. Also used to prevent loss of slurry in cementing operations.

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Jelflake will not ball up. Its crinkled surface prevents particles from adhering to each other. It is packaged in wet-proof 25-pound bags for easy mixing.

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FOR OIL INDUSTRY CHEMICAL SERVICE

WILDCAT COMPLETIONS

J. W. Reynolds 1 Amelia Ochoa Decela, El Grullo Grant. Dry. TD 760 ft.

Zavala County: Union Oil Co. of California 1 Bartlett, AB&M Sur. 85, A-44. Dry. TD 5,457 ft.

TEXAS GULF COAST

Bee County: Bridwell Oil Co. 1 Benson, S. Morris Sur., A-424. Dry. TD 5,360 ft.

DeWitt County: Drilling & Exploration, Inc., 1 Redies, E. Caruthers Sur., A-133. Dry. TD 8,665 ft.

Goliad County: Mark S. Leveridge 1 Vinton, Nancy M. Danforth Sur., A-106. Dry. TD 4,041 ft.

Harris County: Russell Maguire 1 Harris, Victor Blanco Sur. Dry. TD 9,042 ft.

*Jackson County: Maxima Oil Co. 1 Johnson, Section 3, Block 3, A-164. IP 24,900 M.c.f. daily, open flow, casing perforations 3,612-17 ft. TD 4,780 ft. (New field.)

*Maxima Oil Co. 1 Moore, Section 3, Block 1, A-173. IP 15,000 M.c.f. daily, open flow, casing perforations 4,670-76 ft. TD 4,748 ft.

Lloyd H. Smith, Inc., 1 Cement, S. F. Austin Sur., A-5. Dry. TD 7,705 ft.

*Karnes County: Forney & Winn 2 Kunkel et al, Don Erasmo Seguin Sur., A-10. IP 40,000 M.c.f. daily, open flow, upper Reklaw 3,928-38 ft. (casing perforations). TD 4,017 ft. (Extends Hobson field.)

Live Oak County: Frank Frohnhoeger 2 Vann et al, Archibald McDonald Sur., A-280. Dry. TD 5,114 ft.

Victoria County: Monterey Exploration Co. 1 Willemin, C. de la Garza Sur., A-169. Dry. TD 4,604 ft.

Waller County: Brazos Oil & Gas Co. 1 Matzke, I. & GN Sur. 26, A-244. Dry. TD 6,264 ft.

EAST TEXAS

Cherokee County: B. B. Orr 1 Bond-Deloach, Perry Reese Sur. Dry. TD 3,773 ft.

Vernon Whiteley 1 Addie and E. L. Partain, Joseph Thomas Sur., A-831. Dry. TD 4,400 ft.

Delta County: O. P. Leonard 1 Nita Ablowich, E. Littlepage Sur. Dry. TD 6,250 ft., Goodland 5,561 ft., upper Glen Rose 6,111 ft.

Henderson County: J. G. Walker 1 I. P. LaRue, D. O. Williams Sur. Dry. TD 4,832 ft., elev. 390 ft., Woodbine 3,154 ft.

Hunt County: W. H. Bryant 1 W. H. Hunt, W. Lewis Sur., A-628. Dry. TD 3,518 ft.

Johnson County: Austral Oil Exploration Co. 1 Roy C. Gage, Jackson CSL, A-435. Dry. TD 9,646 ft.

Nacogdoches County: Justiss-Mears Oil Co. 1 E. J. Y'Barbo, Unit 1, Jose Flores Sur., A-30. Dry. TD 7,437 ft., elev. 410 ft., Rodessa 7,118 ft.

Navarro County: F. S. G. and G. Oil Co. 1 G. H. Nesbitt, Pedro Quero Sur., A-669. Dry. TD 3,407 ft., elev. 284 ft., Woodbine 3,356 ft.

*Lawton Oil Corp. 1-A Neal, Sidney King Sur., A-458. IP 156 BOPD, 13/64-in., 31?, Pettit 6,828-6,960 ft. TD 6,960 ft.

*Rusk County: Natural Gas & Oil Corp. 1 R. C. Saxon, John Welch Sur., A-846. IP 295 BOPD, 61°, with 6,200 M.f.g., Travis Peak 7,372-87 ft. TD 7,542 ft.

Smith County: Carco Drilling Co. 1 J. W. McClung, Isom Strong Sur., A-1103. Dry. TD 7,800 ft., Woodbine 5,101 ft.

WEST CENTRAL TEXAS

*Brown County: C & S Oil Co. 1 Mrs. Lillie Brewer, Sec. 29, HT&B. IP 39 BOPD, 12/64-in., pay 1,172 ft. TD 1,530 ft.

Coleman County: John J. Eisner 1 E. O. Herring, Sec. 70, J. P. Merrill Sur. Dry. TD 3,600 ft.

G. N. Wallraven and Dock Willeke 1 A. A. Jarrell, Sec. 46, Shelby Smith Sur. Dry. TD 2,751 ft.

Fisher County: E. C. Johnston Co. 1 C. L. Sumrall, 90-1-H&TC. Dry. TD 5,101 ft., elev. 1,901 ft., reef 5,040 ft.

J. W. King, Jr. 1 Fay Young Morton, Sec. 23, Austin & Williams Sur. 349. Dry. TD 3,805 ft.

National Associated Petroleum Co. 1 Frank K. Mitchell, John Rodman Sur. Dry. TD 4,205 ft.

Haskell County: Joe P. Parris 1 S. P. Woodward, 196-45-H&TC. Dry. TD 6,004 ft.

Fred W. Shield and Midwest Oil Corp. 1 Jackson, Lge. 70, Coryell CSL. Dry. TD 5,935 ft. elev. 1,547 ft., conglomerate 5,821 ft.

*Nolan County: Stanolind Oil & Gas Co. 1-E TXL, 15-Z-TXP. IPP 177 BOPD, 40°, Cisco 4,072 ft. TD 6,532 ft.

San Saba County: L. H. Armer 1 Mack Yates, Sec. 2, W. A. Ryan Sur. Dry. TD 1,141 ft.

Stephens County: Oscar Norwood 1 O. C. McClure, 26-6-T&P. Dry. TD 2,185 ft.

NORTH TEXAS

Archer County: Archer Drilling & Production Co. 1 Ray, Blk. 132, Harris Subd. Dry. TD 1,415 ft.

G. W. Graham 1 Ikard, Sec. 1888, TE&L Sur., A-568. Dry. TD 966 ft.

This announcement is neither an offer to sell nor a solicitation of an offer to buy these securities. The offer is made only by the Prospectus.

500,000 Shares

Three States Natural Gas Company

Common Stock

($1.00 Par Value)

Price $7 per Share

Copies of the Prospectus may be obtained in any State only from such of the several Underwriters, including the undersigned, as may lawfully offer the securities in such State.

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May 29, 1953.

Rugged, extra-strength BLOCKS engineered for oil industry needs

HERE is the Washington No. 106 bronze-bushed riggers and utility block with 6" x 1" sheave for up to 1/2" line or 2-ton load capacity. An economical block with smooth cast steel sides, cast steel sheave with Oilite bearing, and forged steel clevis. Weight is just 13 pounds.

Other models of Washington blocks adaptable to oil field construction and operation include cat blocks, moving blocks, snatch blocks and hoisting blocks. All are designed for extra strength and long life. All are backed by outstanding manufacturing facilities and specialized experience in block production.

Write for Catalog No. 35, showing the full line of Washington blocks, clevises, shackles and related equipment. Address Washington Iron Works, 1500 6th Ave. South, Seattle 4, Washington.

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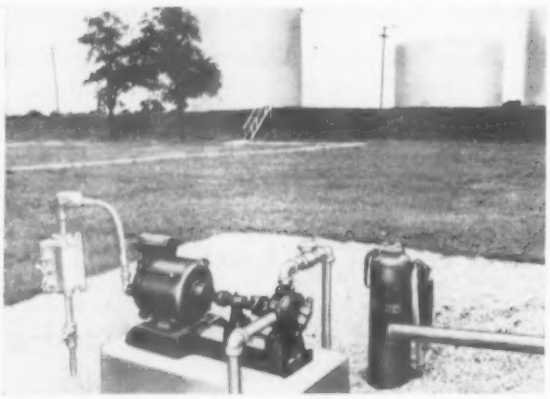

The job of transporting crude oil from many different sources, delivering to refineries, as well as loading tankers with crude, results in the need of fast, positive sump gathering at leakage points.

Small, direct connected Viking pumps in sizes of 5, 10 and 18 gpm are the ideal answer to this problem. Installations include as high as 30 of these pumps in a single terminal.

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Ask Viking for the answer to your problem and for bulletin 1803T which gives complete specifications on these positive, self-priming pumps.

VIKING PUMP CO. CEDAR FALLS IOWA

WILDCAT COMPLETIONS

A. D. McDuffie 1-A Perkins, Blk. 18, Bell CSL, A-12. Dry. TD 1,601 ft.

*Jack Mercer Well Service Co. 1 J. J. Perkins, Blk. 34, Bell CSL. IPP 21 BOPD, pay 1,488-98 ft. TD 1,518 ft.

S. W. Petre 1 Grace Abney Moore, A. T. Akers Sur., A-922. Dry. TD 1,306 ft.

W. C. Wainwright 1 J. D. Bell, Blk. 5, Clark & Plumb. Dry. TD 1,115 ft.

W. C. Wainwright 1-B Campbell, J. Tomlinson Sur., A-452. Dry. TD 1,172 ft.

W. C. Wainwright 1-C Campbell, J. Tomlinson Sur., A-452. Dry. TD 1,152 ft.

W. C. Wainwright 1 Dan Powell, John Harris Subd. Dry. TD 1,277 ft.

Baylor County: Sam Lett 1 J. T. Jarvis, L. A. Hood Sur. 2. Dry. TD 5,370 ft.

Robinson-Puckett, Inc. et al 2 Lowe Stout, 5-45-H&TC. Dry. TD 5,902 ft.

Tres Oil Co. 2-B E. W. Hunt, Blk. 28, J. Garner Sur. Dry. TD 1,532 ft.

Clay County: Humble Oil & Refining Co. 1 T. T. Fenoglio, W. Morse Sur. Dry. TD 6,509 ft.

Republic Natural Gas Co. 1 W. H. Vieth, 8-2-Clark & Plumb. Dry. TD 4,095 ft.

*Cooke County: Potter & Hearne 1 B. F. Watson, John Poe Sur., A-1578. IPP 134 BOPD, pay 3,882 ft., TD 3,387 ft. Extension.

Jay Simmons 1 J. F. Bugg, John Demarous Sur., A-314. Dry. TD 3,369 ft.

*Jack County: Russell Maguire 1 Campsey, C. C. Chance Sur., A-138. IP 12,000 M.f.g., open flow, pay 5,360-66 ft. TD 5,546 ft.

*Mid-Continent Petroleum Corp. 1 E. L. McNeely, L. M. Broadstreet Sur., A-1034. IPP 100 BOPD, pay 3,404-18 ft. TD 4,425 ft.

*Needl & Hood Drilling Co. 1-C Prideaux, Sec. 1, SPRR. IPP 20 BOPD, pay 609 ft., TD 610 ft.

Warren Petroleum Corp. 1 W. L. Nash, C. Vandever Sur., A-867. Dry. TD 5,683 ft.

R. L. Wood 1 Henderson, J. Costly Sur., A-1676. Dry. TD 6,050 ft.

Knox County: Hale Bros. 1 Phillips, 145-45-H&TC. Dry. TD 4,778 ft.

Montague County: E. B. Clark 1 W. A. Williams, George Dooley Sur., Blk. 6. Dry. TD 5,599 ft.

*G. E. Kadane & Sons 1 Gist-Howard, F. Robertson Sur., A-620. IPP 11 BOPD, pay 1,391-1,435 ft. TD 1,742 ft.

Transcontinental Oil Corp. 1 J. P. Waller, Blk. 3, Hill CSL. Dry. TD 7,009 ft.

Wichita County: Kit C. Gray, Jr. 1 Bentley, CTRR Sur., A-443. Dry. TD 205 ft.

Wilbarger County: Dublin-Kiel 1-C Waggoner, 2-5-H&TC. Dry. TD 2,503 ft.

*Thomas A. Perry 1 W. T. Waggoner, 17-5-H&TC. IPP 50 BOPD, pay 2,410 ft., TD 2,416 ft.

*Young County: Joe K. Bailey and Strata Drilling Co. 1 M. K. Graham, TE&L Sur. 1665, A-952. IP 240 BOPD, 5/64-in., Mississippian 4,550 ft., TD 4,599 ft.

Darden & Terry 1 M. D. Wolverton, Blk. 1368, TE&L Sur. Dry. TD 965 ft.

T. V. Gorman 4 E. R. Prideaux, CTRR Sur. 1, A-68. Dry. TD 3,655 ft.

G. E. Kadane & Sons 1-A Clara E. Luton, J. L. Elmore Sur., A-1421. Dry. TD 3,755 ft.

WEST TEXAS

*Andrews County: Continental Oil Co. 1 McCollum-Weibusch, 24-A44-PSL. IP 1,560 BOPD, 1-in., pay 8,708-8,810 ft. TD 9,175 ft.

Texas Pacific Coal & Oil Co. 1-K University. Dry. TD 5,907 ft.

Borden County: Vickers Exploration Co. 1

WILDCAT COMPLETIONS

W. C. Orson, 11-33-T5N-T&P. TD 10,500 ft., reef 8,550 ft., Ellenburger 10,180 ft.

*Coke County: F. Kirk Johnson 1 H. G. Wendland, Sec. 8, J. D. O'Daniels Sur. IP 95 BOPD, 14/64-in., 41°, pay 3,691 ft. TD 3,695 ft.

Concho County: Amerada Petroleum Corp. 1 Ellen Neal Buie, F. Stantz Original Grantee Sur. 1727. Dry. TD 2,995 ft.

Crockett County: John P. Wagner 1-B Shannon Estate, 10-9-V&SE. Dry. TD 6,250 ft.

Dawson County: Fred W. Shield 1 L. Bradford, 1-35-T5N-T&P. Dry. TD 4,351 ft.

Ector County: Cities Production Corp. 1-D Cross, 44-43-T&P. Dry. TD 5,333 ft.

Garza County: Harris & Walton 1 Jessie P. Crump, 38-6-H&GN. Dry. TD 2,566 ft.

Glasscock County: Sinclair Oil & Gas Co. 1 J. W. Cox, 32-33-T4S-T&P. Dry. TD 10,156 ft., elev. 2,677 ft., Devonian 9,982 ft., Fusselman 10,120 ft.

King County: Helmerich & Payne 1 Gay M. Gillespie, 113-F-H&TC. Dry. TD 6,803 ft.

Lynn County: Hassie Hunt Trust 1 J. W. Wilson, 418-1-D&SE. Dry. TD 9,643 ft., elev. 3,214 ft., reef 9,400 ft.

Menard County: Deep Rock Oil Corp. 2 Mabel C. Bevans, Sec. 3, A-347, J. H. Gibson Sur. Dry. TD 3,535 ft., Ellenburger 3,430 ft.

*Mitchell County: Sun Oil Co. 1-A Anderson, 230-1A-H&TC. IP 214 BOPD, 11/64-in., 43°, pay 5,966 ft. TD 6,100 ft.

Pecos County: Stanolind Oil & Gas Co. 1 Pryor, 100-OW-GC&SF. Dry. TD 6,308 ft., elev. 3,096 ft., Yates 2,796 ft., reef 3,176 ft.

Reeves County: Lawless Drilling Co. 1 G. H. Chamblee, 17-C18-PSL. Dry. TD 4,060 ft.

Runnels County: B. H. & L. Production Co. 1 McKnight, 11-A264-HT&B. Dry. TD 3,890 ft.

*E. K. and E. M. Burt 1 Bendina Spill, Blk. 338, J. R. Nunn Sur. IP 192 BOPD, ½-in., pay 4,076 ft. TD 4,095 ft.

*Humble Oil & Refining Co. 1 John L. Barron, R. Clever Sur. 52. IP 113.8 BOPD, ¾-in., pay 3,668 ft., TD 3,682 ft.

Schleicher County: Taylor 1 J. F. Webster, 1-8-TW&NG. Dry. TD 5,602 ft.

*Sterling County: P. L. Crandell 1 Humble, 30-11-SPRR. IPP 72 BOPD, 30°, pay 1,479 ft. TD 1,481 ft.

Sutton County: C. L. Norsworthy, Jr. 1 Meckel, 123-A-HE&WT. Dry. TD 8,220 ft., elev. 2,237 ft., Ellenburger 7,039 ft.

Tom Green County: Amerada Petroleum Corp. 2 Joan Chambers Denis, Sec. 173, SPRR. Dry. TD 5,090 ft., elev. 1,944 ft., Ellenburger 4,684 ft.

Yoakum County: Hunt Oil Co. 1 E. A. Graham, 318-P-J. H. Gibson Sur. Dry. TD 5,445 ft.

SOUTHEAST NEW MEXICO

Lea County: Carper Drilling Co. 1-B Stanolind-State, 2-19s-36e. Dry. TD 40 ft.

Wilshire Oil Co. 21-8 E. L. Harbison, 8-14s-37e. Dry. TD 12, 567 ft., elev. 3,885 ft., Abo 8,112 ft.

ILLINOIS

Christian County: Theo Myers 1 Colbrook, E½ SW NE 13-11n-4w. Dry. TD 2,155 ft.

Clark County: E. Zink 1 Trevghton, SE SW NW 5-10n-14w. Dry. TD 567 ft.

Clinton County: J. G. Brown 1 Wortman, S½ SW SE 27-3n-1w. Dry. TD 2,866 ft.

Coles County: W. A. Fullenkamp 1 Meyers, SW SW SE 4-12n-10e. Dry. TD 940 ft.

Effingham County: A. M. Fowley 1 Roynter, NE SW SE 18-6n-7e. Dry. TD 2,900 ft.

Fayette County: E. H. Kaufman 1 Bussard, NW SW SE 28-9n-3e. Dry. TD 1,994 ft.

Franklin County: Murvin & Steber 1 Messner, SW NW SW 17-7s-4e. Dry. TD 3,152 ft.

Hamilton County: Calvert Drilling Co. 1 Wood, SW NE SW 4-6s-7e. Dry. TD 3,360 ft.

Hancock County: W. C. Stribling 1 Hayden, NE NE NE 26-4n-5w. Dry. TD 480 ft.

Macon County: Welker Oil Co. 1 Chapman, NW NE SW 4-15n-1e. Dry. TD 2,535 ft.

Perry County: Artnell Co. 1 Hood, SW NW SW 18-4s-4w. Dry. TD 2,659 ft.

Richland County: J. W. Rudy 1 Scherer, NE NE SE 7-3n-11e. Dry. TD 3,274 ft.

Washington County: Walter Duncan 1 Williams, SW SW SE 12-3s-4w. Dry. TD 2,749 ft.

White County: Toklan Production Co. 1 Shumaker, NE NE SW 23-4s-9e. Dry. TD 3,375 ft.

INDIANA

DeKalb County: W. H. Bears 1 Lockhart, SE SW SW 6-35n-13e. Dry. TD 2,587 ft.

Dubois County: E. Harter-H. Blackwell 1 McMurtie, NE NE NW 11-3s-5w. Dry. TD 1,374 ft.

T. W. Drake 1 Byers, SW SW SW 29-3s-5w. IP 1,000 M.f.g., Cypress sand 810-25 ft., TD 832 ft. Extensin and new pay, Huntington South pool.

Gibson County: J. L. Black 1 Manning, NW NW SE 32-2s-9w. Dry. TD 2,014 ft.

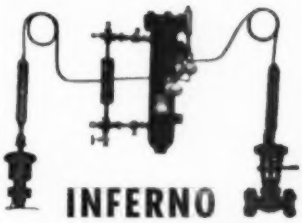
Knox County: M. Johnson Jr. 1 Strashun, Sur. 38-3n-11w. Dry. TD 1,937 ft.

Pike County: J. D. Turner 1 Land, NE NE SW 15-1s-8w. Dry. TD 1,565 ft.

Posey County: C. E. O'Neal 1 Weyerbacher, SE SW SE 22-8s-14w. Dry. TD 3,025 ft.

Spencer County: Stanoco Oil Co. 1 Endicott,

SAFE 3 WAYS



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Boiler Safety Units

1. Automatically controls water level.
2. If water supply should fail and water level drops, a whistle blows.
3. If whistle is unattended, the fire is automatically cut off.

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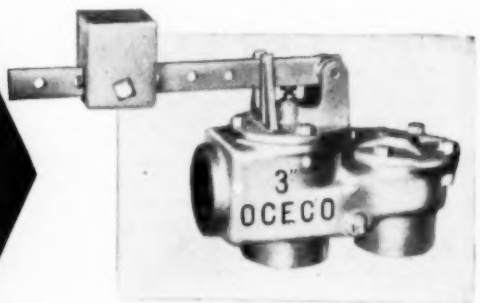

● These valves combine both vacuum relief and pressure relief in a single body and avoid the necessity of using two separate valves when both vacuum relief and pressure relief are desired. 3 inch, 4 inch and 6 inch sizes. Steel bodies. Bronze, stainless steel or aluminum trim. Can be furnished with vacuum relief settings from 1 oz. to 10 oz. per square inch. Pressure relief settings from 2 lbs. to 25 lbs. per square inch. For temperatures up to 650° F.— working pressures up to 30 lbs. per square inch. Write for fully descriptive data sheet.

OCECO TANK FITTINGS
THE JOHNSTON & JENNINGS CO.
division of PETTIBONE MULLIKEN CORP.
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WILDCAT COMPLETIONS

SE NW NW 16-7s-6w. Dry. TD 1,499 ft.
V. T. Drilling Co. 1 Sarver-Underwood, NE NE SW 1-7s-7w. Dry. TD 1,609 ft.
Vigo County: H. J. Adams 1 Nussel, NE NW NW 25-12-8w. Dry. TD 1,628 ft.
C. S. Cooksey 1 Ring, NW NW SE 35-10n-10w. Dry. TD 1,435 ft.

KENTUCKY

Henderson County: Eakle & Holder Petroleum Co. 1 Pierce, SW SE SW 3-Q-20. Dry. TD 2,786 ft.
J. Partin 1 Quinn, NW NW SE 17-P-22 Dry. TD 2,760 ft.
R. E. Hopp-Producers Pipe Line Co. 1 Jack Royster, NW NW SW 11-O-22. Dry. TD 2,706 ft.

MICHIGAN

Allegan County: Ford Oil Co. 1 Smith, SE SE NE 32-4n-11w. Dry. TD 1,928 ft. in Traverse.
Hillsdale County: Jack Uhl 1 Ridler, NW NW NE 15-5s-1w. Dry. TD 1,453 ft. in Traverse.
Mason County: Augie Busk & C. Grines 1 Huddleston, NE NE SE 28-17n-16w. Dry. TD 2,455 ft. in Traverse, Dundee & Reed City zone.
Montcalm County: H. E. Walton 1 Beardsley, NE NE NE 11-10n-7w. Dry. TD 3,375 ft. in Dundee.
Muskegon County: Associated Drillers & Producers, Inc. 1 Miskowitz, SW NW NW 23-9n-15w. Dry. TD 1,961 ft. in Traverse.
Newaygo County: Klondike Petroleum Co., Inc. 1 Bolles, SW SE NE 33-14n-14w. Dry. TD 2,284 ft. in Traverse.
Oakland County: Wm. J. Morriss 1 Smith estate, NE NW SW 15-1n-7e. Dry. TD 529 ft. in Traverse.
Oceana County: Union Development Co. 1 Rockwell, SW NW NW 31-15n-15w. Dry. TD 2,786 ft. in Dundee.
St. Clair County: Charles F. Parkinson 3 Schneider-Lake Shore, NW 18-5n-17e. Dry. TD 2,780 ft. in Niagara.

FLORIDA

Washington County: A. R. Temple 3 Vernon, C NW SE 22-1n-5w. Dry. TD 5,022 ft. Elev. 131 ft., Chalk 2,982 ft., Eagle Ford 3,872 ft., marine Tuscaloosa 4,309 ft., Pilot 4,590 ft., Massive 4,668 ft., lower Cretaceous 4,848 ft.

ALABAMA

Clarke County: Humble Oil & Refining Co. 1 Wright, C NE SE 35-7n-3e. Dry. TD 5,156 ft. Elev. 156 ft.
Monroe County: Sterrett Proctor and I. P. and Fred La Rue 1-A Broughton, SE NW NE 27-11s-14w. Dry. TD 5,433 ft. Elev. 81 ft., Wilcox 60 ft., Eutaw 3,835 ft., lower Tuscaloosa 4,925 ft., lower Cretaceous 5,365 ft.

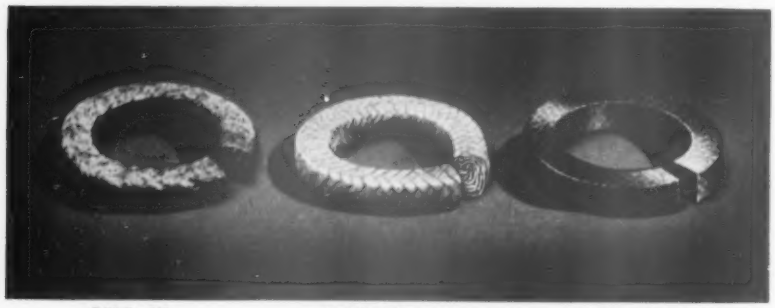
MISSISSIPPI

Amite County: B. Serio and Justiss-Mears Oil Co. 1 Rowland-Gaughon, trustee, E½ SW SW SW 13-4n-2e. Dry. TD 7,263 ft. Elev. 325 ft., Vicksburg 2,830 ft., Wilcox 4,507 ft., base Big Shale 6,566 ft.
*Forrest County: Ohio Oil Co. 1-T Southwest Unit 31, 12-1s-13w. IP 104 BCPD and 4,155 M.c.f. daily, 16/64-in., Tuscaloosa 8,356-75 ft. (casing perforations). TD 8,652 ft. Elev. 291 ft., Wilcox 2,803 ft., Chalk 5,988 ft., Tuscaloosa 7,394 ft., marine Tuscaloosa 7,827 ft., Pilot 8,217 ft. Massive 8,534 ft. (Extends and new pay in Maxie field.)

SOUTH LOUISIANA

*Calcasieu Parish: Shell Oil Co. 1 Leger-Louisiana Canal Unit, SW NE NW 12-9s-7w. IP 245 BCPD and 2,512 M.c.f. daily, 10/64-in., 46.4°, casing perforations 10,874-90 ft. TD 11,190 ft. (New pay in Iowa field.)
*Iberia Parish: The Texas Co. 21-B Vermilion Bay, State Lease 334, Township 15s-5e, in Vermilion Bay. IP 365 BOPD, 10/64-in., 39.1°, casing perforations 12,370-82 ft. TD 12,382 ft. (New pay in Vermilion Bay field.)
Jefferson Parish: Humble Oil & Refining Co. 1 New Orleans Plantation Co., 10-15s-24e (Lake Salvador area). Dry. TD 12,046 ft.
*Lafourche Parish: Tide Water Associated Oil Co. 1 Delta, 35-17s-18e. IP 3,000 M.c.f. daily and 96 BCPD, 14/64-in. choke, 58°, casing perforations 11,700-88 ft. TD 13,255 ft. (New field—North Bourg.)
Plaquemines Parish: *Humble Oil & Refining Co. 1-B State Lease 818, Block 27, West Delta area. IP 6,183 M.c.f. daily, ¼-in., casing perforations 11,988-12,000 ft. TD 12,233 ft. (Extends West Delta area.)
Kerr-McGee Oil Industries, Inc., 1 State Lease 1218, Breton Sound. Dry. TD 3,205 ft. (Core test.)
Kerr-McGee Oil Industries, Inc., 1 State Lease 1219, Breton Sound. Dry. TD 3,198 ft. (Core test.)
Kerr-McGee Oil Industries, Inc., 1 State Lease 1226, Breton Sound. Dry. TD 3,200 ft. (Core test.)
Kerr-McGee Oil Industries, Inc., 1 State Lease 1228, Breton Sound. Dry. TD 3,192 ft. (Core test.)
Kerr-McGee Oil Industries, Inc., 1 State

Wherever You Handle Acids or Chemicals



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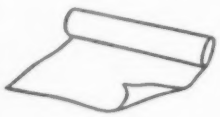
R/M versi-pak® General utility packing



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Block 30, Breton Sountd. Dry. TD 3,250 ft.

St. Mary Parish: Lamson, Bennett & Cole 1 Feitel, 7-18s-12e (Shell Island area). Dry. TD 12,432 ft.

*Terrebonne Parish: The Texas Co. 10-1 Dog Lake Unit, 36-21s-15e. IP 112 BOPD, 10 64-in., 33.7°, casing perforations 14,-113-30 ft. TD 14,467 ft. (New pay in Dog Lake field.)

NORTH LOUISIANA

Claiborne Parish: Pan-Am Southern Corp. and Sunray Oil Corp. 1 B. M. Woods, NW SE 30-22n-8w. IP 827 M.c.f. gas and 37 bbl. 58°-gravity dist. daily, 10 64-in. choke. GOR 22,000-1. Cotton Valley Bodcaw sand 8,716-20 ft. TD 10,359 ft., PB 8,790 ft. Discovery well Blackburn pool.

Grant Parish: Placid Oil Co. 1 J. A. Phillips, SW SW 2-8n-5w. Dry. TD 4,505 ft. Midway 4,073 ft.

F. W. Bates et al 1 Paul A. Duke, S 2 NW NW 9-7n-4w. Dry. TD 6,012 ft.

Red River Parish: E. F. Neely Well Servicing Co. 1 Long Bell Lumber Co., 1,170 ft. S and 2,380 ft. E of NW cor., 4-12n-8w. Dry. TD 1,705 ft.

ARKANSAS

Poinsett County: K. L. Peters et al 1 Weona Farms Co., SE NE 12-10n-4e. Dry. TD 2,657 ft.

OKLAHOMA

Coal County: Gibson & Holliman 1 Thomas, SW NE 10-1s-9e. Dry. TD 5,206 ft.

*H. H. Diamond 1 Spence, NW NW SW 6-2n-8e. IP 4,160 M.f.g., sand 910-36 ft., TD 1,915 ft.

Garvin County: Kouri & Goforth 1 Cozad, SE NW SW 16-2n-3e. Dry. TD 1,400 ft.

Hibdon & Carter 1 Graham, SW NE NW 14-3n-1w. Dry. TD 4,185 ft.

Grady County: Little Nick 2 Goldsmith, NW SE SE 15-5n-8w. Dry. TD 8,752 ft.

Jackson County: Alma McCutchin 1 Hickman, NW SW NE 36-1n-20w. Dry. TD 2,529 ft.

Jefferson County: Texas Pacific Coal & Oil Co. 1 Leo Herndon, NW NW NE 2-4s-5w. Dry. TD 3,341 ft.

Lincoln County: Ben C. W. Hyde, Jr. 1 Turner, SE SE SW 23-15n-3e. Dry. TD 5,074 ft. D. F. O'Rourke 1 Herman, SW SW SW 22-16n-4e. TD 4,152 ft.

*W. H. Martgan 1 Orner, SE SW SE 31-17n-2e. IP 89 BOPD, 25 64-in., Hunton lime 4,697-4,704 ft. TD 5,138 ft. Discovery.

Logan County: Falcon-Seaboard Drilling Co. 1 Clay, SW SW NE 3-17n-3w. Dry. TD 6,226 ft.

Osage County: Hanlon-Boyle, Inc. 1, SW SW NE 5-28n-9e. Dry. TD 1,010 ft.

Payne County: George P. Caulkins, Jr. 1 Bullard, SE SE SE 18-20n-4e. Dry. TD 4,310 ft.

Pontotoc County: Stanolind Oil & Gas Co. 5 R. A. Burk "D," NW NW SE 32-5n-5e. Dry. TD 3,860 ft.

Pottawatomie County: A. A. Cameron 1 Rose, SE SE NE 26-11n-2e. Dry. TD 5,820 ft. Helmerich & Payne 1 Wyatt, SE SE NE 7-11n-5e. Dry. TD 5,058 ft.

Seminole County: H. H. Diamond 1 Clayton, NE NE NW 27-6n-7e. Dry. TD 3,500 ft.

KANSAS

Barton County: *Hanlon & Boyle 1 Kootman, NE NE NE 23-19s-13w. IP 14 BOPD, Arbuckle 3,400-09 ft. TD 3,409 ft. (Kootman pool.)

D. T. Ingling 1 Persons, NE NE SE 7-17s-16w. Dry. TD 3,495 ft. Arbuckle 3,467 ft.

Pickrell Drilling Co. 1 Held, NW NE NW 5-19s-12w. Dry. TD 3,411 ft. Arbuckle 3,381 ft.

Butler County: E. F. Wakefield 1 More, NW NW NW 17-29s-3w. Dry. TD 2,851 ft.

Ellis County: Helmerich & Payne 1 Penney, NW NW SW 17-15s-16w. Dry. TD 3,557 ft. Arbuckle 3,542 ft.

*Imperial Oil Co. 1 Raynesford "A," SW SW NW 17-13s-20w. IP 24 BOPD, Lansing-Kansas City 3,535-40 ft. TD 3,885 ft. (New zone discovery in Raynesford pool. Was Sooy producer.)

Petroleum, Inc., 1 Erbert, NW NW NE 28-12s-20w. Dry. TD 3,940 ft.

Greenwood County: C. E. Ash 1 Lane, SE SE SE 5-26s-12w. Dry. TD 1,800 ft. Mississippi lime 1,743 ft.

Ness County: M. B. Armer 1 Foos, SE SE NE 31-20s-22w. Dry. TD 4,507 ft. Mississippi dolomite 4,409 ft.

Pratt County: *Skelly Oil Co. 1 Chance, SW NW SE 4-26s-13w. IP 1,772 BOPD Simpson sand 4,274-90 ft. TD 4,351 ft. Arbuckle 4,339 ft.

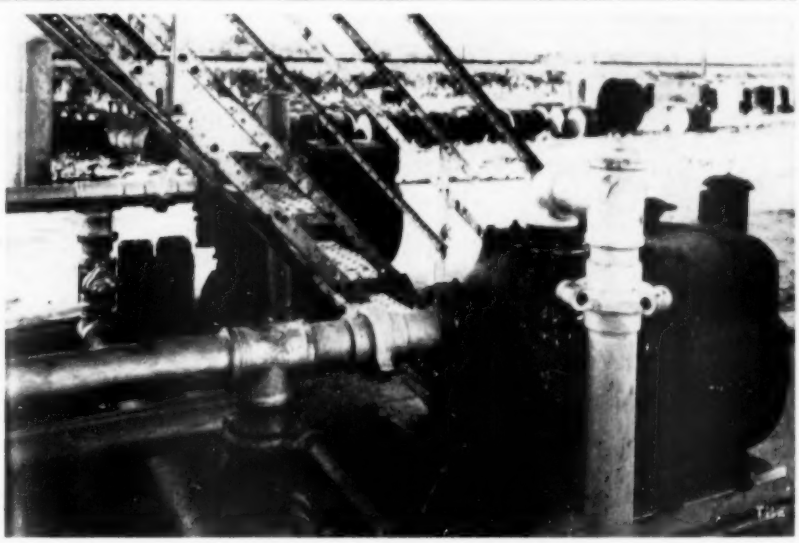
Rooks County: Jones and Shelburne & Farmer 1 Wilson, SW SW SW 34-10s-18w. Dry. TD 3,549 ft.

Rush County: *Musgrove 1 Dirks, NE NW SW, 22-18s-18w. IP 325 BO and 7 BW daily. Arbuckle 3,288-92 ft. TD 3,292 ft.

Sedgwick County: E. F. Wakefield 1 More, NW NW NW 17-29s-3w. Dry. TD 4,355 ft. Lansing 3,136 ft.

Stafford County: *Petroleum, Inc. 1 Newcombe "B," SE SE NW 5-21s-13w. IP 17 BO and 13 BW daily. Lansing-Kansas City 3,438-44 ft. TD 3,629 ft. (New zone

WILDCAT COMPLETIONS



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WATERLOO, IOWA

WILDCAT COMPLETIONS

discovery. Was an Arbuckle producer.)
Birmingham & Batrlett 1 Smith "A," SW NE SW 7-22s-14w. Dry. TD 3,884 ft. Arbuckle 3,877 ft.
Hilton 1 Bair-Yost, N7 NE SE 11-25s-14w. Dry. TD 4,370 ft. Arbuckle 4,316 ft.
*Welch & Olsson 1 Bair, NW NW NE 11-25s-14w. IP 2,396 BOPD. Viola 4,162-65 ft. TD 4,347 ft. Arbuckle 4,319 ft.
Trego County: Rocket Drilling Co. 1 Rinker, SW SW NE 28-12s-20w. Dry. TD 4,162 ft.

CALIFORNIA

Kern County: Golden Bear Oil Co. 1 Seale, 5-30s-29e. Dry. TD 6,057 ft. Finger Nozu 4,107 ft.
San Joaquin Drilling Co. 5 Di Giorgio, 32-30s-30e. Dry. TD 682 ft.
Kern County Land Co. 48-18 KCY, 18-29s-26e. Dry. TD 7,923 ft. Stevens 7,852 ft.
Hancock Oil Co. 2 Miller, 14-30s-28e. Dry. TD 7,340 ft.
J. F. Kosanke 1 Kosanke & Troutt, 14-11n-18w. Dry. TD 767 ft.
Kings County: W. W. Holmes, Opr. 1 Green Community, 13-23s-22e. Dry. TD 3,710 ft.
Monterey County: Western Gulf Oil Co. 1 Rosenberg-Bernard. Dry. TD 1,212 ft.
Orange County: Red Star Oil Co. & Pacific Drilling Co. 1 Red Star Lomita, 29-5s-11w. Dry. TD 4,480 ft.
San Joaquin County: Union Oil Co. 1 Union-Brazos-Cotta, 2-3n-5e. Dry. TD 4,600 ft.

MANITOBA

Imperial 13-4 Blue Wing Lake, LSD 13, 4-24-27w1, TD 2,976 ft. Dry.

SASKATCHEWAN

Nancy 2, LSD 11, 6-43-16w3, TD 2,201 ft. Dry.
Tide Water-Imperial 2 Plata Crown, LSD 11, 28-25-15w3, TD 2,150 ft. Dry.
Allenbee-Peak & Associates-Canada Southern 1 Salter, LSD 1, 29-38-16w3, TD 2,510 ft. Dry.

ALBERTA

Mac-Sil Co. Leaseholds 1 H. B. Amisk, LSD 8, 26-42-8w4, TD 3,800 ft. Dry.
Gulf 3 George, LSD 3, 16-34-21w4, TD 6,950 ft. Dry.
Socony 1 Sage Creek, LSD 15, 22-3-3w4, TD 5,300 ft. Dry.

BRITISH COLUMBIA

Pacific 4 Fort St. John, LSD 4, 23-86-21w6, TD 7,376 ft. PB 4,650 ft. Mississippian gas well.

UTAH

Duchesne County: Carter Oil Co. 1 Duchesne County, SE NW 25-3s-5w. IP 266 BOPD, 19/64-in., Green River 1,425 ft. TD 5,257 ft.

COLORADO

Jackson County: Placid Oil Co. 1 Carl D. Johnson, NE NE 22-8n-78w. Dry. TD 8,115 ft. in Cretaceous.
Logan County: Plains Exploration Co. 1-A State, NW NE SE 16-7n-52w. Dry. TD 4,833 ft.
Anderson-Prichard Oil Corp. 1 Baker, SW SW NE 28-12n-50w. Dry. TD 4,910 ft.
Morgan County: William R. Whittaker 1 Bush, SW SE NW 2-2n-60w. Dry. TD 6,413 ft., Skull Creek 6,404 ft.
Weld County: Sherrod & Apperson 8 Miles & Don Gillette, NW NW 9-9n-61w. IPP 279 BOPD, Lyons sand 8,482 ft. TD 9,663 ft. New pay discovery.

NEBRASKA

Cheyenne County: Ohio Oil Co. 1 Atkins, S½ SE NW 7-13n-50w. IP 5,650 M.f.g., open flow, "D" sand 4,618 ft., TD 4,850 ft.
Deuel County: Sherrod & Apperson 1 Christenson, SE NE NW 17-13n-45w. Dry. TD 3,969 ft., Lakota 3,884 ft.
Sherrod & Apperson 1 Monks, NE NE SE 24-14n-45w. Dry. TD 3,850 ft., "J" sand 3,721 ft.

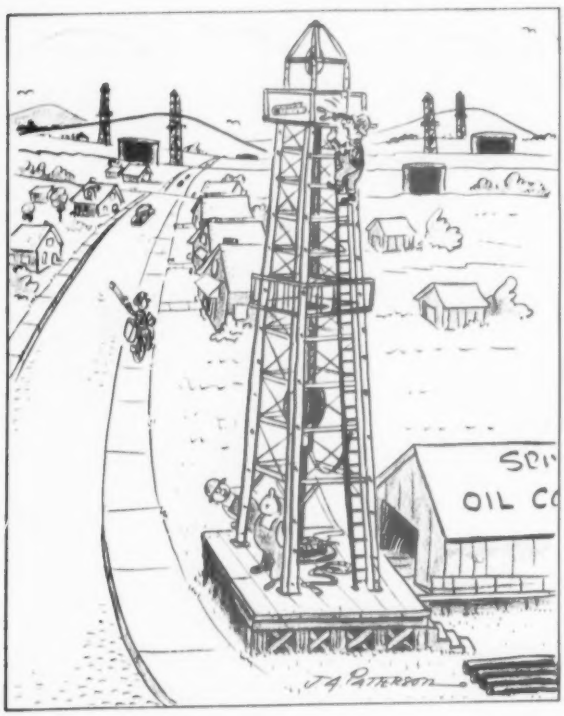
WYOMING

Big Horn County: Gulf Oil Corp. 1 Thomas, S½ NE SE 33-50n-92w. IP 820 BO in 12 hours, 32/64-in., 36°, Phosphoria 7,088-7,160 ft. TD 7,188 ft. Discovery.
Natrona County: Superior Oil Co. 33-20 Geary Dome Unit, NW SE NW 20-34n-77w. Dry. TD 6,974 ft., Dakota 6,913 ft.
Niobrara County: Rocket Drilling Co. and Crusader Corp. 1 Rocket, NE NE SE 7-36n-63w. Dry. TD 4,520 ft., Morrison 4,510 ft.
H. L. Hollingsworth 1 Government, SE SE NW 30-39n-61w. Dry. TD 2,832 ft.
Washakie County: Pearce Well Service 1 Government, NW SE NE 8-48n-90w. Dry. TD 1,932 ft., Tensleep 1,905 ft.

NORTH DAKOTA

Bottineau County: Ward Williston Drilling Co. 1 Bert O. Klokstad, NE NW 36-164n-79w. IPP 90 BOPD, cut 30 per cent water, Mission Canyon 3,077 ft., TD 3,081 ft.
McKenzie County: Amerada Petroleum Corp. 1 Catherine Peck, SW SE 27-150n-96w. Dry. TD 9,532 ft., Ellis 5,833 ft.

(Continued on page 193)



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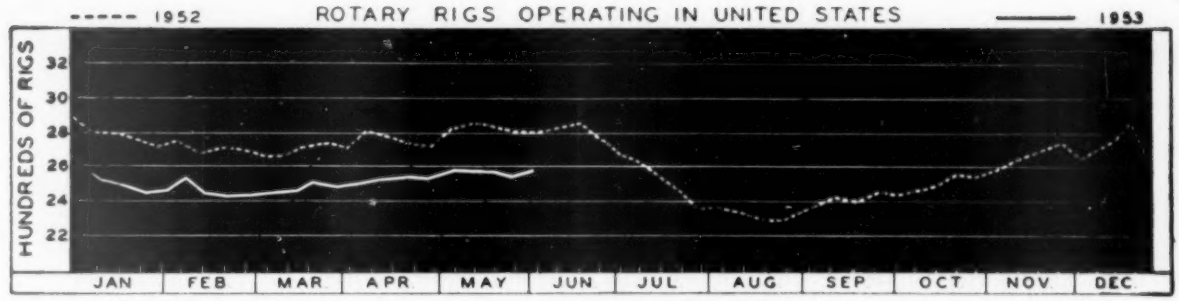
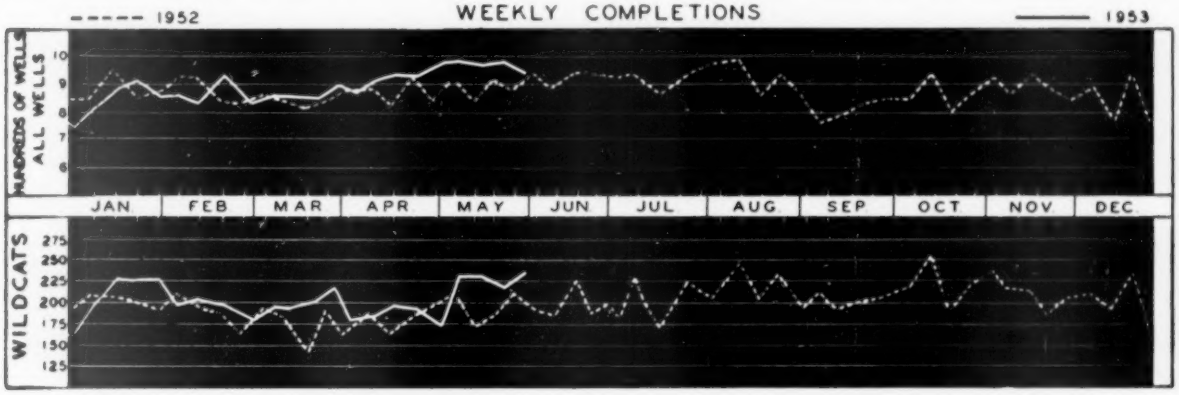




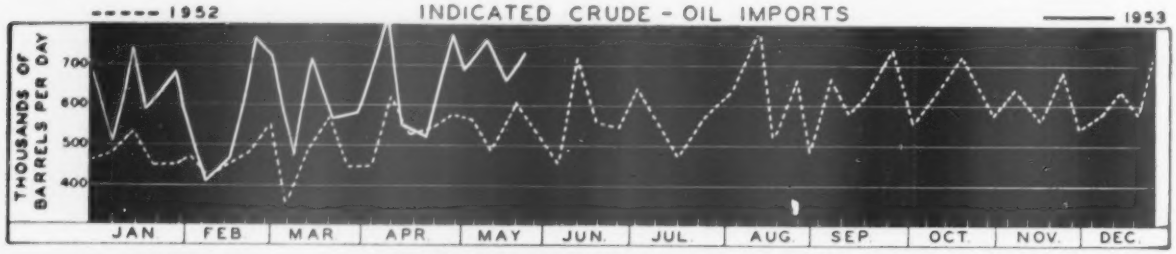
CURRENT STATISTICS

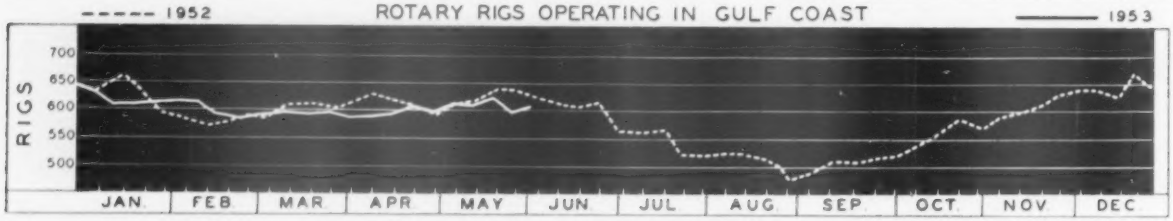
EXPLORATION

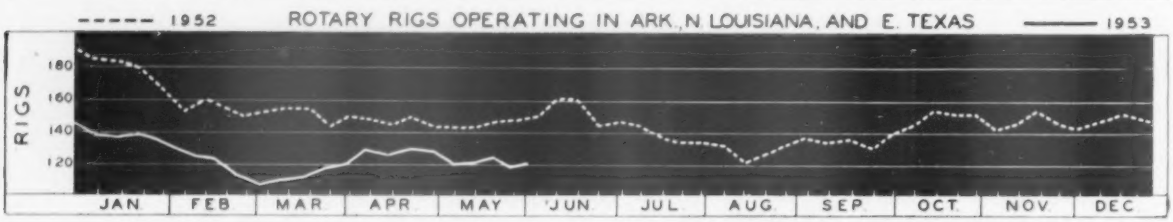
WEEKLY WELL COMPLETIONS . . . WEEK ENDED MAY 30, 1953

	Total of all wells					May 30		Wildcat completions and discoveries					Cumulative total, 1953				
	Comp.	Oil	Gas	Dry	Footage	1953	1952	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	13	7	0	*6	19,200	280	319	0	0	0	0	0	0	0	0	0	0
Pennsylvania	33	16	4	†13	62,100	692	701	0	0	0	0	0	0	0	3	8	11
West Virginia	8	0	8	0	25,906	241	251	0	0	0	0	0	0	0	4	2	6
Ohio	22	12	1	†9	44,519	405	394	0	0	0	0	0	1	0	1	10	12
Indiana	26	6	2	18	43,816	492	450	0	0	1	10	11	8	0	2	114	124
Kentucky	19	7	4	8	43,421	432	543	0	0	0	4	4	5	0	0	78	83
Illinois	41	14	0	27	93,255	691	644	0	0	0	14	14	3	0	0	141	144
Michigan	13	3	0	§10	36,580	223	283	0	0	0	9	9	7	0	3	90	100
Kansas	106	56	4	*46	356,722	2,020	1,942	4	0	0	13	17	44	0	19	313	376
Nebraska	4	1	1	2	17,259	120	97	0	0	1	2	3	8	0	1	53	62
Oklahoma	132	72	7	53	473,857	2,860	2,433	1	0	1	15	17	50	4	13	260	327
Texas	331	191	19	121	1,532,722	7,043	7,606	18	1	6	87	112	359	25	87	1,717	2,188
North Central (Dist. 7-B & 9)	119	67	1	§51	398,128	2,561	2,399	9	0	1	33	43	183	0	9	710	902
West (Dist. 7-C & 8)	79	59	0	20	429,408	1,549	2,357	6	0	0	18	24	73	2	5	267	347
Panhandle (Dist. 10)	6	5	1	0	20,005	342	290	0	0	0	0	0	0	2	0	10	12
Eastern (Dist. 5 & 6)	15	6	0	9	89,896	334	377	2	0	0	9	11	11	2	3	112	128
Gulf Coast (Dist. 2 & 3)	47	19	10	18	252,251	1,058	1,140	0	0	3	8	11	50	5	38	269	362
Southwest (Dist. 1 & 4)	65	35	7	23	343,034	1,199	1,043	1	1	2	19	23	42	14	32	349	437
Louisiana	49	25	6	18	380,195	1,032	930	2	3	1	10	16	25	9	10	140	184
Northern	16	5	3	8	59,869	401	484	0	1	0	3	4	1	1	2	48	52
Southern	33	20	3	10	320,326	631	446	2	2	1	7	12	24	8	8	92	132
Arkansas	6	3	0	3	28,102	183	157	0	0	0	1	1	5	0	0	35	40
Mississippi	6	2	0	4	35,970	141	161	1	0	0	1	2	7	0	3	69	79
Southeastern States	3	0	0	3	15,611	56	24	0	0	0	3	3	1	0	0	41	42
Montana	9	5	1	3	35,716	151	89	0	0	0	2	2	2	0	0	38	40
Wyoming	11	6	0	5	52,465	239	262	1	0	0	4	5	7	0	0	40	47
Colorado	9	2	3	4	46,590	202	165	1	0	0	4	5	8	2	5	98	113
Utah	2	2	0	0	15,317	31	27	1	0	0	0	1	2	0	0	19	21
New Mexico	31	11	16	4	171,645	536	404	0	0	0	2	2	8	0	6	54	68
California	61	49	2	10	266,977	1,054	1,050	0	0	0	9	9	24	0	3	235	262
North Dakota	6	3	0	3	48,059	104	17	1	0	0	2	3	3	0	0	20	23
Miscellaneous	0	0	0	0	0	20	31	0	0	0	0	0	1	0	0	16	17
Total United States	941	493	78	370	3,846,004	19,248	18,980	30	4	10	192	236	578	40	160	3,591	4,369
Total previous week	983	534	81	368	4,038,991			42	2	8	165	217	548	36	150	3,399	4,133
Total May 31, 1952	935	489	59	387	3,965,478			19	4	5	163	191	598	44	107	3,306	4,055

Service wells included: *6, †13, §4, §1, ¶2



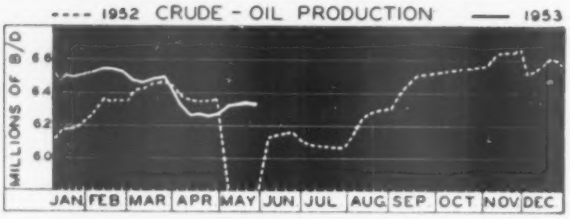


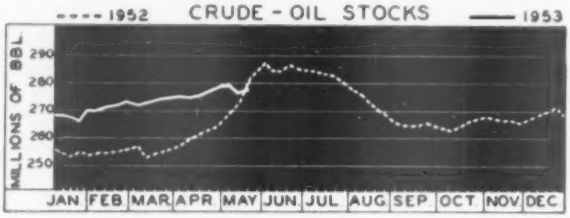


DAILY AVERAGE PRODUCTION FOR WEEK

	May 30			May 23
	Crude oil	Lease condensate	Total	total
Alabama	4,900		4,900	4,800
Arkansas	77,100	700	77,800	77,900
California	1,001,850		1,001,850	1,000,200
Colorado	99,700		99,700	98,500
Eastern	58,100		58,100	58,000
Florida	1,450		1,450	1,500
Illinois	162,700		162,700	162,200
Indiana	35,600		35,600	35,200
Kansas	321,500		321,500	330,900
Kentucky	30,200		30,200	29,600
Louisiana	660,875	41,100	701,975	702,175
North	110,550	2,600	113,150	113,350
South	550,325	38,500	588,825	588,825
Michigan	36,700		36,700	33,700
Mississippi	93,350	4,150	97,500	99,100
Montana	31,000		31,000	30,500
Nebraska	13,700		13,700	13,600
New Mexico	189,225	700	189,925	189,925
Oklahoma	531,900		531,900	534,300
Texas	2,671,575	45,475	2,717,050	2,717,050
Dist. 1	35,075	350	35,425	35,425
Dist. 2	146,500	6,325	152,825	152,825
Dist. 3	438,625	23,000	461,625	461,625
Dist. 4	248,725	5,200	253,925	253,925
Dist. 5	46,700	400	47,100	47,100
Dist. 6	119,950	5,700	125,650	125,650
East Texas field	247,000		247,000	247,000
Dist. 7-B	108,000	75	108,075	108,075
Dist. 7-C	151,800	3,500	155,300	155,300
Dist. 8	888,250	200	888,450	888,450
Dist. 9	168,250	700	168,950	168,950
Dist. 10	72,700	25	72,725	72,725
Utah	5,000		5,000	5,100
Wyoming	211,300		211,300	208,500
North Dakota	14,000		14,000	14,200
Total U. S.	6,251,725	92,125	6,343,850	6,346,950
Change from previous week, down			3,100	
Canada	210,800		210,800	212,975
Total U. S. production January 1-May 30			963,493,025 bbl.	
Same period last year (crude plus cond.)			*921,480,000 bbl.	

*Includes 13,358,835 bbl. condensate.



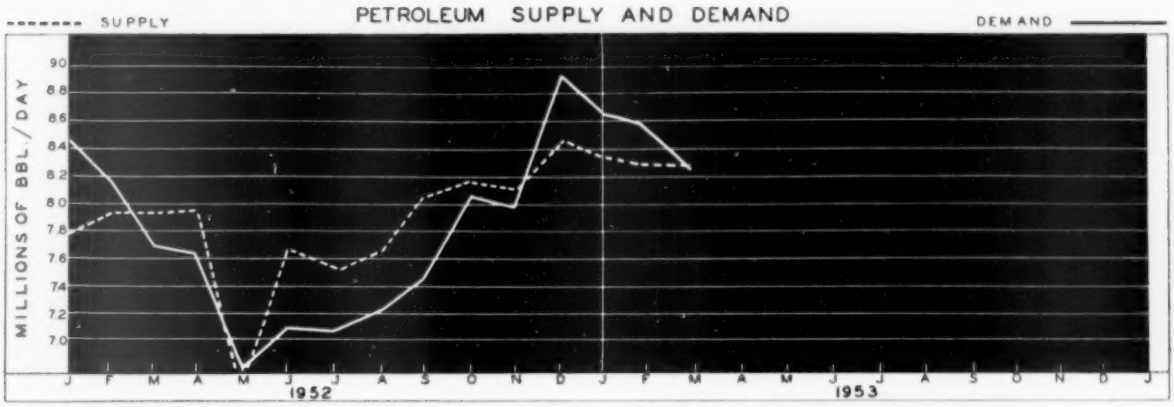


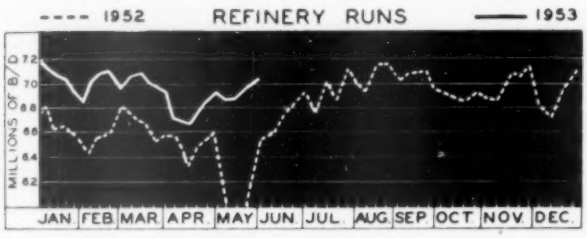
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

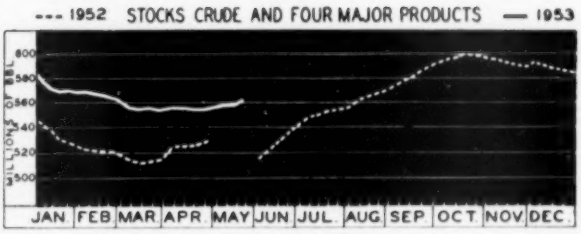
(Thousands of barrels)

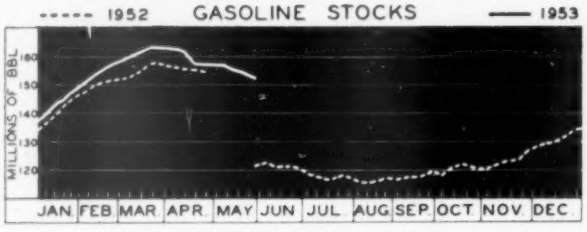
	May 23, '53	May 16, '53	May 24, '52
Pennsylvania Grade	2,509	2,519	2,445
Other Appalachian	2,100	1,912	2,056
Illinois, Indiana, Michigan	11,974	11,890	12,486
Arkansas	2,917	2,917	3,192
Louisiana	16,407	16,173	15,941
North	2,833	2,899	2,931
Gulf	13,574	13,274	13,010
Mississippi	4,044	4,144	3,763
New Mexico	7,090	7,234	7,504
Oklahoma and Kansas	38,630	38,389	43,777
Texas	132,324	133,787	140,798
East Texas proper	11,305	10,915	13,791
West Texas	62,768	64,471	61,575
Texas Gulf	25,496	25,523	31,625
Other Texas	32,755	32,878	33,807
Rocky Mountain	17,779	16,015	15,134
California	32,361	32,193	30,281
Foreign	10,155	9,675	8,436
Total	278,290	276,848	285,813

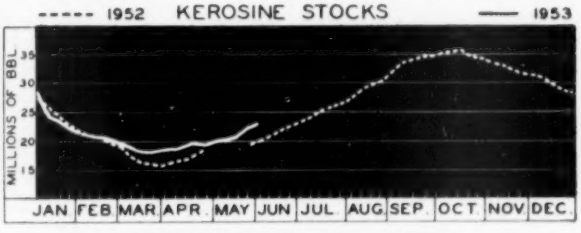
*Bureau of Mines.

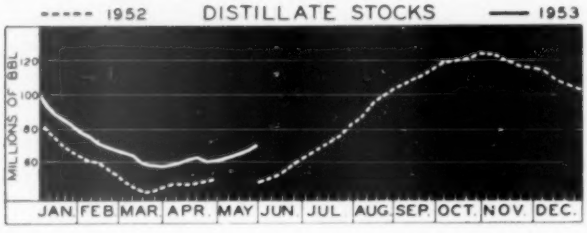


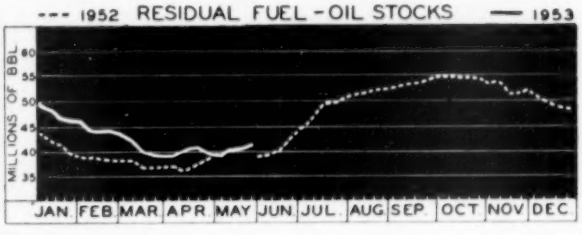










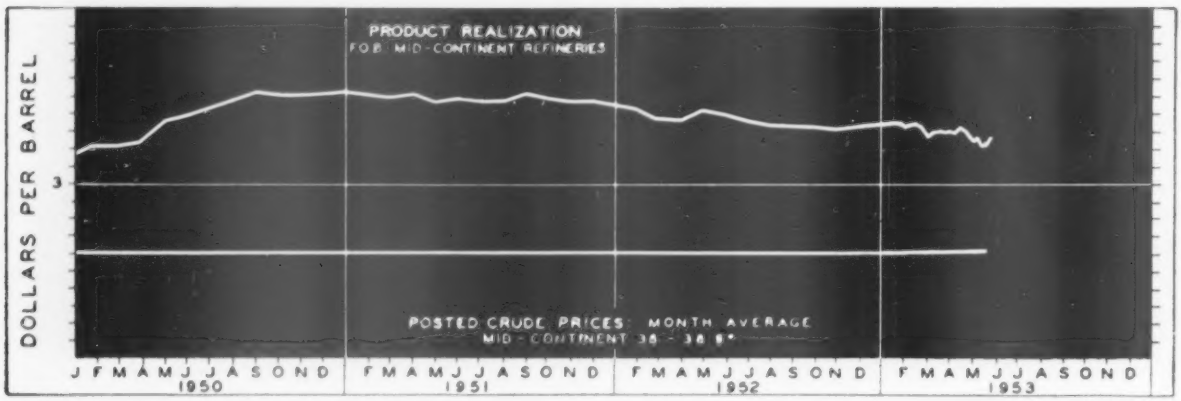


A.P.I. REFINERY REPORT, MAY 30

(Thousands of barrels)

District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, May 1952 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid
East Coast	1,027	426.1	35.6	237.8	242.1	34,024	10,233	23,287	11,300	1,005	411.0	43.0	219.7	203.7
Appalachian:														
District 1	86	33.6	4.3	19.8	13.9	3,501	459	866	344	102	43.9	3.3	16.3	13.3
District 2	88	44.9	2.3	9.9	13.0	1,648	262	418	119	43	22.9	2.0	7.3	8.6
Ind., Ill., Ky.	1,301	683.4	80.4	215.6	166.4	31,412	4,086	10,523	3,213	741	378.1	37.3	127.4	105.0
Okla., Kans., Mo.	562	315.3	24.4	119.1	55.6	16,665	1,410	7,509	1,208	373	205.9	9.5	82.7	37.7
Inland Texas	252	166.3	14.4	39.6	32.7	6,468	426	1,345	1,091	269	187.8	12.4	41.6	42.2
Texas Gulf Coast	1,762	802.7	124.7	398.8	248.2	20,836	3,326	9,675	6,161	629	270.1	55.0	184.7	77.3
La. Gulf Coast	565	278.3	44.3	148.6	50.1	7,549	2,122	4,742	1,134	507	236.8	51.6	110.9	59.1
N. La. and Ark.	88	32.0	8.4	20.7	7.4	3,218	385	975	169	66	22.7	3.6	14.9	7.7
Rocky Mountain:														
New Mexico	19	12.0		2.9	3.7	166		33	28	17	10.1	.5	3.1	4.3
Other Rocky Mtn.	244	120.8	8.0	49.6	45.3	6,772	402	1,696	924	189	79.9	4.0	41.1	36.0
California	1,053	458.0	12.9	147.3	345.0	20,176	416	9,773	15,734	964	426.0	6.3	132.0	383.7
May 30, 1953	7,047	3,373.4	359.7	1,409.7	1,223.4	152,435	23,527	70,842	41,425	4,905	2,295.2	228.5	981.7	978.6
May 23, 1953	6,983	3,306.1	328.0	1,405.7	1,192.6	153,923	22,540	67,052	40,629					
May 31, 1952	5,573	2,535.9	258.9	1,082.6	1,121.6	122,161	19,050	50,966	38,523					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipe lines.


PRODUCT REALIZATION
F.O.B. MID-CONTINENT REFINERIES
DOLLARS PER BARREL
3
POSTED CRUDE PRICES: MONTH AVERAGE
MID-CONTINENT 38 - 38.8°
J F M A M J J A S O N D
1950
F M A M J J A S O N D
1951
F M A M J J A S O N D
1952
F M A M J J A S O N D
1953

In this trend chart refinery realization is based on average Mid-Continent grade crude oil (not 38° gravity only) and average prices for refinery products as published in The Oil and Gas Journal basis Oklahoma (Group 3). Refinery yields confined to gasoline, kerosine, distillate and fuel oil. Realization averaged $3.28 for week ended May 23, $3.22 for previous week, and $3.41 for May 1952. The above trend information is based on volumes and current prices and therefore does not reflect changes in operating costs.

REPRESENTATIVE QUOTATIONS

Representative spot-market quotations of leading suppliers as of June 3, 1953. Figures are f.o.b. plant for tank-car shipments in cents per gallon, except for residual fuel oil which shows the price per barrel and wax, in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline	10⅜-10½	12-12.75	10¾-11
Premium gasoline	11⅜-11½	13.125-14	11¾-12
42-44 w.w. kerosine	8⅜-8¾	10.15-10.65	9
No. 2 straw fuel oil	7⅜-7¾	9.15-9.65	8
No. 6 residual	$0.90-1.00	$2.10-2.25	$1.60-1.70

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	5½	5	5¼
Grade 18-55	6.60	6.10	6.35

LUBRICATING OILS

South Texas

200 vis., No. 2-3 neutral	12-13
750 vis., No. 3-4 neutral	15-16
2,000 No. 5-6 neutral	17-18

LUBRICATING OILS

Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	19.5-21
200 vis., No. 3 neutral, 0-10 pp.	13

Western Pennsylvania

145-155 vis., 10 p.t. bright stock	25.5
180 vis., 10 p.t. neutral	27.5

WAX

Mid-Continent

132-134 A.M.P.	6.0

SUPPLIERS in the Mid-Continent area are debating the question of supply and demand for residual fuel. Some believe that residual production in the Mid-Continent and North Central areas will be cut back enough this summer to strengthen the market to at least $1.00 a barrel.

The contraseasonal firming of the inland residual market in April and May seems to have been due to reduced production of heavy fuel rather than to abnormal demands. For the first 3 weeks of May, refinery yields of residual in the Illinois-Indiana-Michigan and Oklahoma-Kansas-Missouri districts were lower than the average for May 1952 despite the fact that refiners last year were trying to boost yields of gasoline.

The increase in volume of coke produced at inland refineries is an indication of the shift away from production of residual fuel. Coke-production figures are not available on a weekly basis, but in the first 3 months of this year refiners in the Mid-Continent and North Central districts increased coke production 7.4 per cent over the same period last year compared with a gain of only 3.3 per cent in refinery runs.

Reports indicate that other refiners in the Mid-Continent have started coking units in the past few weeks or plan to start in June.

Residual-fuel supply and demand have been about in balance on the East Coast with the price unchanged at $2.10 for material without sulfur guarantee. Gulf Coast supply held most quotations at $1.60. Residual from an Inland Texas refinery that moved to northern markets last year is reported to be moving to the Gulf.

Very little activity has resulted from summer discounts for distillate fuels on the East Coast. Unconfirmed reports indicate offerings of No. 2 fuel in New York Harbor at as much as 0.25 cent a gallon under the normal barge price of 9.15 cents.

CRUDE PRICES GRAVITY SCHEDULE

	Signal Hill, Calif‡	Okla. homa, Kansas	Gulf Coast Tex.*	West Tex.†
14-14.9	$1.87	.....	.....	.....
15-15.9	1.93	.....	.....	.....
16-16.9	1.99	.....	.....	.....
17-17.9	2.05	.....	.....	.....
18-18.9	2.11	.....	.....	.....
19-19.9	2.18	.....	.....	.....
20-20.9	2.24	$2.25	.....	$2.12
21-21.9	2.30	2.27	.....	2.14
22-22.9	2.37	2.29	.....	2.16
23-23.9	2.45	2.31	.....	2.18
24-24.9	2.53	2.33	$2.56	2.20
25-25.9	2.61	2.35	2.58	2.22
26-26.9	2.69	2.37	2.60	2.24
27-27.9	2.76	2.39	2.62	2.26
28-28.9	2.83	2.41	2.64	2.28
29-29.9	2.91	2.43	2.66	2.30
30-30.9	2.97	2.45	2.68	2.32
31-31.9	3.04	2.47	2.70	2.34
32-32.9	3.12	2.49	2.72	2.36
33-33.9	.....	2.51	2.74	2.38
34-34.9	.....	2.53	2.76	2.40
35-35.9	.....	2.55	2.78	2.42
36-36.9	.....	2.57	2.80	2.44
37-37.9	.....	2.59	2.82	2.46
38-38.9	.....	2.61	2.84	2.48
39-39.9	.....	2.63	2.86	2.50
40 and above	.....	2.65	2.88	2.52

*For crude from Daboval, El Campo, and Sand Point.

†Includes Lea County, New Mexico.

Last general price change represented a 50-cent increase, effective December 6, 1947.

‡Standard Oil Co. of California.

FLAT CRUDE PRICES

Representative posted schedules per barrel.

Louisiana:	
Beauregard Parish	$2.60
Cotton Valley (distillate)	2.85
Cotton Valley (crude)	2.70
Texas:	
East Texas	2.65
Pecos County (Yates)	2.35
Conroe	2.83
Van	2.48
Pennsylvania Grade:	
Bradford	4.40
Southwest Pennsylvania	3.97
West Virginia	3.91
Illinois Basin	2.77

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SUPERIOR HEAVY DUTY DIESEL
510 hp. at 360 r.p.m.—5 cylinder—14½x18 type ZDSB — non-reversing — vertical—4 cycle—cold starting—mechanical injection. Engine is totally enclosed. Complete with a 48" 7 groove V-belt sheave and new spare parts. For heavy duty pumping, dredge service, power generation, textile and saw mills, mining, etc. EXCELLENT CONDITION, IMMEDIATE DELIVERY.

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30 kw. Sheppard—115 volts DC—radiator cooled. Built 1950. Excellent condition. Self-mounted radiator and fuel tank. 16 units available.

100 KW G. M. 3-268A A.C. DIESEL GENERATOR SETS
440 volts—3 phase—60 cycle. 20 kw. D.C. generator on same shaft—5 kw. exciter—120 volts D.C.—electric starting.

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Slow speed heavy duty unit. 150 hp.—5 cyl.—4 cycle—720 r.p.m.—electric starting—Ross heat exchanger—engine operating panel. Allis-Chalmers generator—100 kw.—440/3/60—80% PF—cubicle deadfront switchgear. Can quote with radiator if desired.

300 KW G. M. D.C. DIESEL SET
ENGINE: G.M. 8-268A—6½x7—1200 r.p.m.—air starting. GENERATOR: 300 kw. G.E.—120/240 volts D.C.—3 wire—totally enclosed—Marine type BB—with switchgear.

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300 kw—120/240 volts D.C.—1200 r.p.m.—1250 amps.—turbine W.P., 225 lbs. to 440 lbs.

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1050 sq. ft.—3000 sq. ft.

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BALTIMORE 2, MARYLAND
CURTIS 7-5050

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N-4 BREWSTER rotary drilling rig, 12" Gardner-Denver pump w/ NKU Waukesha engine, Lee C. Moore mast, 5½' Substructure, 5800' of 3½" Ext. upset int. flush drill pipe. All purchased new. Has been in use 12 mos. A-1 condition. Write Box 4657, Oklahoma City, or Pho. ME 4-1413.

FOR SALE: Model R.L. 3-Drum Cardwell Spudder, Trailer Mounted, complete with all tailing-in tools. 7000 feet almost new 9/16-inch and ¾-inch lines. Will sell with or without tools. For full description and inventory, write Box G-406, The Oil and Gas Journal, Tulsa, Oklahoma.

USED ROTARY, cable tools, and production equipment. E. A. Kelly, 3131 S.E. 29th Street, P. O. Box 861, Oklahoma City. Phone Jackson 56407.

FOR SALE
35,000 bbl. steel tank, 90' x 31'; weight, 120 tons; 6 rings. Excellent condition. Located Renova, Pa. Price $6000.00 as is. Large quantity 2" line pipe and tubing.
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407 First National Bank Bldg.
Cincinnati 2, Ohio Phone Garfield 1310

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AIR COMPRESSOR—Gardner-Denver Diesel Portable, Model 500, serial #154230, with Cat D13,000 eng. Our meter reading is 3608 hours, has never been sold, but rented only. Mounted on four 7.50 x 20 pneumatic tires. FOB Louisville **$7,250.00**

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TRACTOR—International TD14, serial #TDF-9898T4, equipped with Heil angledozer controlled through a Heil DDPCU. A wide gauge machine (74") which has 18" grousers, crankcase guard, front pull hook. The engine in this outfit, which has gasoline conversion starting, runs good and smoothly. Bargain priced! FOB Paducah **$3,500.00**

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SUPPLY CO.
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FOR SALE: 8″ C. P. Drill Collars. W. E. Dunigan, % Dunigan Tool & Supply Co., Odessa, Texas.

FOR SALE

Complete National 100 Rig including 3 PTD-6 Superior Diesel Engines with dual fuel equipment, 136′ Lee C. Moore Mast with 8′ substructure, 2 C-350 Ideal Power Pumps, Ideal Type 548 TC Traveling Block, Type R3 Swivel, and Type MS-20½ Rotary Table. Excellent condition, priced reasonable, located in Montana. Complete inventory upon request.

Box G-341

The Oil and Gas Journal,
Tulsa, Oklahoma

FOR SALE

4500′ 4″ standard, 2500′ 4½″ standard, 9200′ 6″ standard, in single and double random lengths, plain end, all straight, clean, shows no pitting, located Rawlins, Wyoming.

10,000′ 4¾″ O.D. used seamless steel tubing, ⅜″ wall, approx. 28′ lengths, plain end, located near Chicago.

We carry large quantities of used seamless steel boiler tubing from 1⅞″ O.D. to 5½″ O.D. suitable for high pressure oil, gas and water lines, all straightened, cleaned inside and out, shows practically no pitting, all tested for 1000# hydrostatic pressure at our plant before shipment.

Also large quantities of new and guaranteed used steel pipe and tubing up to 36″ in diameter in lightweight, standard and extra strong.

All for immediate shipment. Please phone or wire collect.

A. GREENSPON PIPE CO., INC.
50 South Bemiston Avenue
St. Louis 5, Missouri
Phone: PArkview 6885

FOR SALE

COMPLETE ROTARY DRILLING RIG

1—Wilson Super Titan Draw Works—Complete with Foster Spinning Cathead—Foster Breakout Head—Double Hydraulic Brakes—Four Engine Compound—Air Control operated with Westinghouse Compressor.

4—Cummins 600 Disel Engines with Substructures.

1—136′ Lee C. Moore Derrick with substructures.

1—8″ x 20″ Gardner Denver Power Pump complete.

1—7¼″ x 18″ Wilson Snyder Power Pump complete.

2—Cameron 900 Series 10″ Blowout Preventors.

15—4″ x 30″ Drill Collars.

Approx. 13,000 feet of 4½″ OD 16.60 lb. Grade "E" Extra Hole Drill Pipe—Flashweld Joints.

Mud Tanks—Fuel Tanks—Circulating Tanks. All necessary tools and pipe for operating rig.

This equipment in first-class condition ready to move on well and start drilling.

FOR COMPLETE INVENTORY—CALL—WIRE—WRITE

BROWN PIPE & MACHINERY COMPANY

FOrtune 7431 1311 W. T. WAGGONER BLDG.
FORT WORTH, TEXAS

EQUIPMENT FOR SALE

FOR SALE: In Oklahoma and Kansas approximately 9 miles 2″, 11 miles 3″, 10 miles 4″, 10 miles 6″, and 6 miles of 7″, lapweld used plain end, plain end beveled, and T&C used line pipe. Complete list furnished upon request. Cities Service Oil, Patridge, Bartlesville, Oklahoma.

USED 4½″ and 3½″ Sonoscoped Drill Pipe, Casing, Tubing, Rotary and Cable Tool Rigs and production equipment. Giffin & Thompson Supply, Hoisington, Kansas. Tel. 477.

TWO light shot hole drills. Hydraulic rigs mounted on used Ford trucks. Just came out of the field. Price $3500.000 each, with used water truck included. Located at 3820 N. W. 39th Street in Oklahoma City. Phone Windsor 2-4226. Young Exploration Company.

FOR SALE: 5—Shriver 42″x42″ cast iron Filter Presses, Plate & Frame Type, 27, and 54 chambers 1″ cake; 15—Sperry 18″x18″ cast iron Filter Presses, 11 chambers; #12 Sweetland Filter for 72 monel covered leaves on 2″ centers. Immediate shipment. Attractively priced. Consolidated Products Co., Inc., 17-20 Park Row, New York 38, N. Y. BArclay 7-0600.

FOR SALE OR TRADE: Allis-Chalmers deep drilling in unit. All metal mounted on rubber. Price $7500. Phone 5-5714, Tulsa.

FOR TRADE: Cardwell Oil Well Service Unit complete. What have you? J. L. Chew, Lyons, Kansas.

FOR SALE: 1951 Chevrolet tank truck with 100 bbl. Freuhauf trailer. 1950 451-G M.C. with 118 Bbl. Star Tandem Transport. One International K-L with 111 Bbl Columbia Tandem Transport. Above Trucks are equipped with 3″ Viking Pumps and 3″ Hose. Also: 2—40 Hp. Bettis Boilers mounted on 2 ton Trucks. 1—40 Hp. Bettis Boiler in Skid House. This equipment is in excellent condition, and will be priced upon request. Rankin Oil Well Servicing Company, Box 249, or Telephone 230, Rankin, Texas.

NEW LEE C. MOORE 100′ Cantilever Mast for sale. 18′ x 40′ 9″ base. 510,000#. Herman Graham Drilling Co., Salem, Ill.

DRILLING EQUIPMENT FOR SALE. Mud pumps, swivels, travelling blocks. This equipment is brand new and produced by a reliable manufacturer, and is offered for sale at reduced prices. Box G-523, The Oil and Gas Journal, Tulsa, Oklahoma.

WANT EQUIPMENT: Did you find the equipment you wish to purchase in this column? If not, use an "Equipment Wanted" classified advertisement to find it. It is available somewhere and Journal classified advertisements will find it. See box heading for classified rates, or write The Oil and Gas Journal.

FOREIGN
TUBING
CASING
LINE PIPE
Buy NOW
to fill in domestic shortage.
Early shipment direct from mills
in Germany - Japan
A.P.I. Specifications
Mill Agents

Glenn A. Smith & Associates
555 So. Alexandria Ave.
Los Angeles 5, California

EQUIPMENT WANTED

NOTICE: We buy. We sell equipment everywhere. If you want to sell or buy, contact Pressey & Son, Pueblo, Colorado.

WANTED—Bolted type steel tanks, new, and if used must be A.P.I. late type having a capacity of 500 bbl. and larger. Also high pressure welded steel tanks 10,000 gal. and larger for propane.

A. GREENSPON PIPE CO., INC., 50 South Bemiston Avenue, St. Louis 5, Missouri. Phone: PArkview 6885.

EQUIPMENT WANTED

WILL PAY highest prices for used casing, used line pipe, abandoned leases, or other surplus lease equipment. Your idle producing equipment is worth dollars. Green Pipe & Supply Co., Box 1383, Tulsa, Oklahoma.

EQUIPMENT NOT IN USE: Did you find a buyer in this column for the equipment you have for sale? Someone wants it and an "Equipment For Sale" classified advertisement in the Journal will find a buyer. See box heading for classified rates or write The Oil and Gas Journal.

HELP WANTED

WANTED: Engineer with mechanical, Petroleum or Chemical background. Some field experience desirable. Work involves product development and manufacturing for substantial and growing Company. Opportunity for right man. Write Box 2204, Odessa, Texas. Replies confidential.

PROCESS ENGINEERS

Engineering contractor has openings which offer excellent opportunities for young Process Engineers with background in chemical, refining, or gas & gasoline industries, for permanent position in office located in Tulsa, Oklahoma. One to five years experience is desirable but college education & willingness to assume responsibility are essential. Applicants should write giving age, resume of experience, education and salary expected. Please address Box G-519, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED

PRODUCTION SUPERINTENDENT
CHIEF PETROLEUM ENGINEER
EQUIPMENT ENGINEER
RESERVOIR ENGINEER
DRILLING ENGINEER
PRODUCTION FOREMAN
GASOLINE PROCESS ENGINEER
ASSISTANT CHIEF GEOLOGIST
SURFACE GEOLOGIST
SUBSURFACE GEOLOGIST
EXPLOITATION GEOLOGIST

For work on DeMares Concession, Colombia, South America. Excellent salary plus substantial income tax savings. Good living conditions. Two year contract. Annual local vacation and paid vacation to United States if contract renewed. Give details of age, education and experience by letter. All replies held confidential. Reply to Box G-516, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED

CHIEF GEOLOGIST

for

Aggressive Independent Oil Company

Operating in Rocky Mountain Area, Mid-Continent, North and West Texas.
Experience in these areas desirable. Give complete details of education and experience by letter in duplicate. All replies held confidential.

Box G-460
THE OIL AND GAS JOURNAL
Tulsa, Oklahoma

HELP WANTED

GASOLINE Plant Chief Chemist for water, corrosion, and product control. Graduate preferred but not required if experienced. Excellent salary and opportunity with large progressive independent. Write Box G-514, The Oil and Gas Journal, Tulsa, Oklahoma.

ELECTRIC LOGGING man with all around experience, including interpretation, operation and maintenance. Good salary and opportunity to acquire interest in aggressive electric well surveying company with good future. Address Box G-497, The Oil and Gas Journal, Tulsa, Oklahoma.

LAND MAN
Large company which is well known in Southern states has recently opened a district Geological, Exploration and Production office in New Orleans and needs for that office a land man familiar with South Louisiana. Such man should also have familiarity with Southern Mississippi. Prefer a man under 42 years of age and one familiar with farm-out negotiations, operating contracts, lease acquisitions and lease record procedure and titles. Company is entering South Louisiana on a conservative basis. In replying state age, experience in detail, education, and references, enclosing recent photograph. So as not to jeopardize your present position your application will be held in confidence. Box G-453, The Oil and Gas Journal, Tulsa, Oklahoma.

MUD ENGINEER
California drilling contractor has opening for man who has actual field experience. Give age, training and experience in first letter. Box G-513, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL Industry Employment Service. 405 Tuloma Bldg., Tulsa, Okla. 4-5974. Tom Robinson, owner. For Technical and Trained Personnel, including LPG

PETROLEUM ENGRS., GEOLOGISTS, REFINERY MEN; Rocky Mtn. positions with Majors and Independents. Specialists in drilling, production, reservoir, refinery operation. Professional Placement Service, 516 University Bldg., Denver, Colorado.

CHEMICAL Engineer for work in natural gas and gasoline field with independent in West Texas. Gasoline plant experience desirable, but not required. Include education, complete brief of experience, and salary expected, in first reply. Box G-492, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEERS

FOREIGN SERVICE

Graduate engineers with good background in general physics, mathematics, mechanics and with some laboratory experience in equipment and techniques. For laboratory position responsible for theoretical experimental studies on reservoir fluid and rocks. Duties will consist of designing equipment, performing or supervising testing and analyzing and reporting results. Studies pertinent to evaluation of primary depletion practices and applicability of secondary recovery for pressure maintenance operation will be required.

Please write giving full particulars regarding personal history and work experience. Please include telephone number.

RECRUITING SUPERVISOR
BOX OG-5

Arabian-American Oil Company

505 Park Avenue
New York 22, N. Y.

HELP WANTED

FOREIGN EMPLOYMENT. List of oil companies and drilling contractors showing where to apply for foreign jobs. OMAL Co., Box 2603, Tulsa, Okla. $5.00 cash.

CONTINENTAL Oil Company has several openings for Petroleum Production Engineers in the Rocky Mountain Region. Minimum 3 years' experience required. Also have opening for Mechanical Engineer with oil field experience. Apply to C. C. Frye, Regional Petroleum Engineer, Denver, Colorado.

PRODUCTION SUPERINTENDENT — Independent oil company has opening around June 15th for experienced production man familiar with all phases of development and lease operations in Mid-Continent Area—Age 30 to 45. In replying, furnish past ten-year employment record. Box G-522, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: Experienced Safety Engineer, for oilwell drilling contractor, with nine (9) rotary rigs operating in West Texas and Southeast New Mexico area. In applying, give age, references, and experience. Reply Box G-496, The Oil and Gas Journal, Tulsa, Oklahoma.

POSITION OPEN

District geologist for petroleum exploration in Texas Central Gulf Coast region with newly organized production company. Headquarters in Houston. Must have a degree in geology, and three to five years sub-surface geological experience in area. Salary open. Box G-528, The Oil and Gas Journal, Tulsa, Oklahoma.

THE POSITION YOU WANT: Oil industry companies are looking for men to fill every conceivable kind of position. If you didn't find the position in this column that you are looking for, use a "Situation Wanted" classified advertisement to state your qualifications. Some company is probably looking for your ability. See box heading for classified rates or write The Oil and Gas Journal.

SITUATIONS WANTED

OFFICE MANAGER, Controller, Executive Assistant desires responsible supervisory position with growing oil company, Rocky Mountain Area preferred. Presently employed by oil refinery on West Coast. Six years extensive experience with emphasis on public and personnel relations with this company. Accounting background. Age 31. Married. Box G-532, The Oil and Gas Journal, Tulsa, Oklahoma.

FOREIGN ASSIGNMENT wanted by graduate Civil Engineer, with ten years in tropics in charge responsible work. Experienced in design and construction of oil field installations, including buildings, roads, bridges, and airfields. Extensive survey and mapping experience, including location surveys. Skilled in inventories, with profound knowledge of materials, warehousing and handling, and transportation methods. Speak Spanish. Box 306, Voth, Texas.

ATTENTION: Well established oil well drilling contractor desires to manage and supervise: Individuals', groups', small or medium-sized oil companies' drilling, production and operating problems in Central and Western Texas, and New Mexico. Personal interview by appointment is desired. Makin Drilling Company, Box No. 1628, Ph. No. 3-3141, Hobbs, New Mexico.

AUDITOR and accountant diversified experience with Major Company desires employment with smaller organization. Have office management experience. Age 32. Box G-529, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM Engineer, 36, married. Desires position with major or active independent. Twelve years experience. Production problems; well completions; reconditioning and recompletion recommendations, gas lift; water flood; reservoir studies. Excellent references. Available immediately. Mid-Continent or Rocky Mountains preferred. Box G-530, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOPHYSICIST, Gravity experience, M. S. degree. Box G-526, The Oil and Gas Journal, Tulsa, Oklahoma.

M.E. AND I.E. GRADUATE seeking manufacturers to represent in Okla. area. Three years selling experience. One year equipment buyer large oil company. Own car, single, free to travel. Box G-477, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

LANDMAN, 10 years experience all types of land transactions relating to exploration. Presently employed. Business degree, Oklahoma University. Will go anywhere. Box G-499, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST: 34, family, employed. 8 years major oil company experience, subsurface, surface. 4 years Rocky Mountains. Prefer position with Major or large independent in Rocky Mountains. Box G-500, The Oil and Gas Journal, Tulsa, Oklahoma.

ACCOUNTANT - EXECUTIVE who now has own business desires employment with established company. Experience includes all phases of Oil Company Accounting including systems, procedures and mechanical methods. 20 years with major company. Box G-507, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCTION ENGINEER, aggressive, extensive experience in drilling and production operations. Desire Rocky Mountain location with progressive firm. Box G-512, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOPHYSICIST 8 years experience in oil exploration including interpretation, administration, and geological coordination work. Presently employed directing varied geophysical program in South America. Desires responsible position in oil exploration work in eastern USA. Box G-511, The Oil and Gas Journal, Tulsa, Oklahoma.

LANDMAN: Age 32. Experienced all phases land work. Wants to join solid progressing company. Prefer West Central Texas but will consider relocating. Available any time for interview. Box G-515, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST with 30 years experience in oil exploration plans change. Now executive with major company. Excellent record, including the discovery of substantial oil and gas reserves at moderate cost. Interested in new connection based on salary combined with either stock option or other incentive plan. Replies invited from principals only. Write Box G-521, The Oil and Gas Journal, Tulsa, Oklahoma.

THE RIGHT MAN: Can you fill the position you have open from the qualifications listed in this column? Men are always looking for an opportunity to improve themselves. Use a "Help Wanted" Journal classified advertisement to find the men you need. See box heading for classified rates or write The Oil and Gas Journal.

LEASE AND DRILLING BLOCKS

CASH OFFERS WANTED for 6¼% Royalty Rights on 160 acres of potential oil land in Williston Basin area, South Eastern Saskatchewan, Canada. Located one mile south of "Well" brought into production last January, by Tide Water Oil & Gas Co. Oil circles termed "Well" greatest light oil discovery in Province, and "Press" reports gave initial flow as 150 barrels per hour unofficial. Advertisers Mineral Rights are leased to prominent oil company from whom he holds $10,000.00 Drilling Commitment Bond to drill "Test Well" on his land on or before 31st January 1954. Address replies to 908 Kiniston Avenue, Los Angeles, California, to 28th June.

WILL pay cash instantly for leases (large blocks), royalties, mineral deeds, production. Write fully—P. O. Box 2153, Denver Colorado.

SE NEW MEXICO—A NEW OIL FIELD

We predict on evidence developed that offset well to S.I. well will open field. Engineering reports gratis to those who value facts. Close in O.R. Ride Royalty & Leases open.

W. J. PETERMAN, GEOLOGIST
1918-1953
Portales **New Mexico**

LEASES ROYALTIES

Producing and Nonproducing

Bought and Sold—Any Area

Inquiries Invited

B. D. BUCKLEY

6635 Delmar Ave., St. Louis 5, Mo.

LEASE AND DRILLING BLOCKS

FOR Central Kansas drilling deals see Lewis Short, Burrton, Kansas.

FOR SALE: Large block of ten year leases located in Nebraska's portion of the Salina Basin, Township 23N, Range 6E, Cuming County, Nebraska. Inflammable Gas escaping within 2 miles of leases. Doodles really go into action. Overall Geology indicates basement at about 3000 feet. Contact Twibell and Demaree, 211 North 13th St., Norfolk, Nebraska. Phone 812.

SEE A. L. Bowles, Rollow Building, Ada, Oklahoma, for drilling deals.

LOOKING FOR A LEASE? There will be over 40,000 wells drilled this year. If you are looking for a lease, drilling block, or drilling deal and haven't found it in this column, or if you have a lease or drilling block you want drilled, a Journal classified advertisement can find an interested party. See box heading for classified rates, or write The Oil and Gas Journal.

ROYALTIES

PRODUCING ROYALTY and overrides for sale. Wire-write-call for particulars. JACK EAGLE, 706 City Natl. Bldg., Okla. City, Okla. REgent 6-7027.

QUICK CASH: Producing royalties, Overrides or Production . . . no delay. Phone 72-4533, Robert L. Kinkaid . . . P.O. Box 96, Tulsa, Oklahoma.

GET TOGETHER: Both Capital and Royalties are available. If the investment proposition you want isn't listed in this column use a Journal classified advertisement to find it. See box heading for classified rates or write The Oil and Gas Journal.

WE WILL BUY

Producing royalties overriding royalties and production, any amount. Submit complete detail information. Confidential.

COMBEST ROYALTY COMPANY
Amarillo Building, Amarillo, Texas

ROYALTIES WANTED
Producing Royalties
High Grade Only
Send Full Particulars
Address

C. C. HARMON
719 World Bldg., Tulsa, Okla.
P.O. Box 2151

MANUFACTURERS REPRESENTATIVE

ESTABLISHED Sales Engineer organizing Manufacturer's Agency Southern California. Excellent contacts oil companies, large industries. Financially responsible. Offer aggressive and highest type technical representation. Desire related lines, pumps, valves, steam specialties, power and process piping products. Box G-525, The Oil and Gas Journal, Tulsa, Oklahoma.

ELECTRICAL CONTRACTORS

Office Phone 5-5315 — **Res. Phone** 7-4950

W. L. RATCLIFF COMPANY
ELECTRICAL CONTRACTORS
Industrial—Commercial—Distribution
W. L. Ratcliff — **506 Caddo St.**
P. O. Box 373 — **Shreveport, La.**

PRODUCTION WANTED

WANT to buy production in Texas or Oklahoma. Box G-527, The Oil and Gas Journal, Tulsa, Oklahoma.

WANT TO BUY

From Principal Owners Only
At Least 1,000 Bbls. Per Day of
Settled Production
Cash Deal Preferred

Box G-531, The Oil and Gas Journal, Tulsa, Oklahoma

REAL ESTATE

SPACE IS NEEDED: A Journal display classified advertisement is the quickest way to rent or sell your real estate. In the present period of expansion oil industry firms urgently need the space you have available. If it isn't listed here, you may also find it by stating your needs in these pages. For classified rates see box heading or write The Oil and Gas Journal.

LAND AUCTION
Tuesday, June 16, 2 P.M.

320 acres of land and 3/32 of Royalty. 14 oil wells all in operation, paying about $1,000.00 month. Good river bottom farm, good improvements, 8 room modern house. ⅓ of crop goes with the land. Royalty starts paying, July 1, 1953. Land is located west half of Section (30) Township (20) and Range (5), 15 miles north of Hutchinson, Kans. Terms 20% down payment, balance due on approval of title.

Gus H. Knacksted (et others) Conway, Kans., Owner.

R. M. KREHBIEL & SON
McPherson, Kans., Auctioneers

Johns-Manville Appoints Six Regional Managers

Continued growth of Johns-Manville's contract industrial insulation business has led to the appointment of six regional construction managers in strategic areas throughout the country, it was announced recently by D. D. Crews, Johns-Manville manager for construction.

New regional construction managers appointed are: W. H. G. Murray, New York region, Syracuse; V. D. Suiter, Philadelphia region; James Collins, Cleveland region; H. P. Barnes, St. Louis region; W. F. Quinby, Houston region, and J. B. Jobe, Los Angeles region. G. L. Maw has been named assistant Cleveland region construction manager with headquarters in Detroit.

Hunter to Head Advertising For Griscom-Russell Co.

William H. Hunter now heads the advertising activities of The Griscom-Russell Co., manufacturer of heat-transfer apparatus. Hunter has been with Griscom-Russell for many years. He has had considerable experience in product design as well as in various types of advertising and public relations. In addition to guiding Griscom-Russell publication advertising program, he will also be in charge of preparing bulletins on the company's products and house organ.

Hunter succeeds James R. Davidson, former advertising manager for 3 years, who has resigned to accept a similar position with Lake Erie Engineering Co., Buffalo.

Houston Oil Field Opens Three New Branch Stores

Houston Oil Field Material Co., Inc., has announced the opening of new

branch stores at Pearsall, Tex., and Lovington, N. M.

A. R. King has been named store manager at Pearsall with D. M. Rogers as field salesman. The following appointments have been made at Lovington: K. R. Murphy, store manager; C. S. Maxie, field salesman; C. H. Plummer, field salesman; Paul Gavin, field salesman, and James Page, field salesman.

Homco has opened a new service-tool branch store at Williston, N. D., to better serve the Rocky Mountain area. Tony Jones is in charge of operations at this service point.

Hill & Christopher Move To Larger Quarters

Hill & Christopher Advertising, Los Angeles, now occupy custom-built offices in the modern Halliburton Building. Expansion of present business and addition of new clients has made the move necessary. In recent months Hill & Christopher have added three new accounts and four new employes.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington 25, D.C. Notice is hereby given that two tracts of land containing approximately 1866 acres in the Barksdale Air Force Base, Bossier Parish, Louisiana, will be offered for oil and gas leasing through competitive bidding on the terms specified to qualified bidders of the highest cash amounts per acre as a bonus for the privilege of leasing the lands. Title to these lands was acquired by the United States, and jurisdiction over the oil and gas deposits therein was transferred to the Department of the Interior under authority of Executive Order No. 9337 of April 24, 1943, by Public Land Order No. 884 of February 5, 1953. All bids must be submitted to the Administrator, Bureau of Land Management, Washington 25, D. C., on or before 1 p.m. of the date set out herein. Each bidder must submit with the bid one-fifth of the amount bid in cash or by certified check, cashier's check, or by money order made payable to the order of the Treasurer of the United States, and file the showing of qualifications to receive a lease required under 43 CFR 192.42(e)(4) and (f), Circular No. 1840. The envelopes should be plainly marked that they are not to be opened before the date and hour set out herein, and should show the number of the tract and the name of the field. No bids received after the hour fixed herein for receiving bids will be considered. The remainder of the bonus and the annual rental must be paid and an acceptable surety bond in the sum of $25,000 must be furnished by a successful bidder prior to the issuance of a lease. The deposits of the other bidders will be returned upon acceptance of the successful bids. Bidders are warned against violation of section 1860, Title 18, U. S. Code, prohibiting unlawful combination or intimidation of bidders. The right is reserved to reject any and all bids. Royalties payable to the United States will be at the rate of 16⅔ per cent on all production. Annual rental or minimum royalty will be $1.00 per acre. Full details, including a description of the lands offered, and the form of lease offered, may be secured from the Oil and Gas Supervisor, U. S. Geological Survey, Box 311, Tulsa, Oklahoma, or from the Director, U. S. Geological Survey, Washington 25, D. C., or from the Washington office of the Bureau of Land Management. Bids must be submitted on each tract separately. If both tracts are awarded to the same bidder, such tracts may be included in a single lease. Bids must be submitted on or before 1 p.m., Eastern Standard time, June 24, 1953. Edward Woozley, Administrator.

ADVERTISERS

Advertising Council, The 133
Allis-Chalmers Mfg. Co. 8, 9
Aluminum Co. of America 52
American Car and Foundry Company 25
American Cyanamid Company 18
American Telephone & Telegraph Co. 26
Anchor Petroleum Company 53
Anglo-Iranian Oil Company, Ltd. 169
Atlantic Refining Company, The 12, 13
Bakelite Company
A Division of Union Carbide and Carbon Corporation 161
Baker Oil Tools, Inc. 56
Barrett Division of Allied Chemical & Dye Corp. 29
Beacon Petroleum Company 73
Beaird Company, Inc., The J. B. 89, 90
Bethlehem Supply Co. 75
Black, Sivalls & Bryson, Inc. 32
Brodie Co., Inc., Ralph N. 150
Burgess-Manning Company 19
Cabot Shops, Inc. 15
Cameron Iron Works, Inc. 125
Caterpillar Tractor Co. 7
Chain Belt Co. 43
Chicago Bridge & Iron Company Inside Front Cover
Classified Advertising 189, 190, 191, 192
Cleaner Pipelines Co. 149
Construction Machinery Company 133
Continental Supply Co., The 20, 21
Cooper-Bessemer Corp., The 93
Crane Co. 2
Crose Manufacturing Co., Inc., M. J. 153
Cummins Engine Co., Inc. 97
Curtin & Co., W. H. 156
Dean Brothers Pumps, Inc. 151
De Laval Steam Turbine Co. 14
Delta Engineering Sales Co. 160
Dolge 172
Dow Chemical Company, The 149
Dowell Incorporated 178
Drilling & Service, Inc. 184
du Pont 39, 40
Eaton Manufacturing Company, Axle Div. 143
E-I-M Company, Incorporated 101
Elliott Company 42
Empire Trust Company 165
Emsco Manufacturing Company 20, 21
Flint Steel Corporation 152
Fluor Corporation, Ltd., The 115
Foxboro Company, The 24
General Electric Co., Electronic Dept. 30, 31
Goodrich Company, B. F. 3
Grancell, I. H. 154
Graver Tank & Mfg. Co., Inc. 126
Griscom-Russell Co., The 144
Grove Regulator Co. 33
Guiberson Corporation 104
Halliburton Oil Well Cementing Co. 5, 51
Honeycutt, Broaddus 151
Houston Ready-Cut House Co. 160
Hughes Tool Co. Back Cover
Inferno Co., The 154, 181
Johnston & Jennings Company, The, Division of Pettibone Mulliken Corporation 181
Jones & Laughlin Steel Corporation Supply Division 28
Kaiser Steel Corporation 27
Keasbey & Mattison Company 22
Kewanee-Ross Corporation 41
Kinzbach Tool Co., Inc. 165
Koch Engineering Company, Inc., The 158
Kraloy Plastic Pipe Co. 175
Ladish Co. 107
Lane-Wells Company 119
Lehman Brothers 179
Link-Belt Speeder Corporation 23
Magnet Cove Barium Corp. 155
Manco Mfg. Co. 52
Marley Company, Inc., The 44
Marlow Pumps 45
Mathieson Chemical Corporation 108
Mayes-Bevan Company 162
McKee & Co., Arthur G. 16, 17
Midwest Piping Company, Inc. 37
Minneapolis-Honeywell Regulator Co., Industrial Division 10
Mixing Equipment Co., Inc. 134
National Airoil Burner Co., The 159
National Supply Co., The 34, 35
National Tank Company 194
Nicolet Industries, Inc. 153
Nordberg Mfg. Co. 176
Norris Manufacturer, Inc., W. C. 54
Oakite Products, Inc. 140
Oil Base, Inc. 136
Oil Well Supply Co. 4
OPW Corporation 161
Orbit Valve Company 111
Pacific Car and Foundry Company 47
Pacific Pumps Inc. 171
Peerless Supply Co. Inc. 151
Penberthy Injector Co. 11
Petroleum Distributing Co. 156
Petroleum Electric Power Assn. 147
Pipe Line Service Corp. 130
Pittsburgh Coke & Chemical Co. 6
Pyrene Manufacturing Company 49
Raybestos-Manhattan, Inc., Packing Div. 182
R-P & C Division of American Chain & Cable Co. 174
Reed Roller Bit Company Front Cover
Roebling's Sons Company, John A. 170
Rosen Associates, Ralph 159
Sawyer-Jensen-Ross Co. 96
Schlumberger Well Surveying Corp. 177
Seismograph Service Corp. 167
Snap-On Tools Corporation 50
Standco Brake Lining Co. 156
Steel Forgings, Inc. 149
Timken Roller Bearing Company 36
Tulsa Crating Co. 52
Twin Disc Clutch Co. 53
Union Carbide and Carbon Corporation, Bakelite Company 161
U. S. Steel Corp. Subsidiaries 4
United Supply & Manufacturing Co. 132
Victor Products Corp. 160
Viking Pump Co. 180
Visco Products Co., Inc. 71
Visking Corporation, The 140
Vogt Machine Co., Henry 38
Walker Co., W. L. 151
Warner Lewis Company 152
Washington Iron Works 180
Web Wilson Oil Tools 172
Welex Jet Services Inc. 48
Wickes Boiler Co., The 173
Wilson Manufacturing Co., Inc. 122
W-K-M Company 46
Wood's Sons Co., T. B. 151
Youngstown Sheet and Tube Company Inside Back Cover

WILDCAT COMPLETIONS

(Continued from page 184)

Mountrail County: M. B. Rudman-New Concord Development Co. 1 George Nessett, SE NW 30-157n-94w. Dry. TD 10,360 ft., Jefferson 9,862 ft.

MONTANA

Big Horn County: Shell Oil Co. 3 Crow, SW NE 6-10s-38e. Dry. TD 4,730 ft., Ash Creek 4,637 ft.

Prairie County: Shell Oil Co. 32-11-B Unit, SW NE 11-12n-56e. Dry. TD 9,148 ft., Ordovician 8,837 ft.

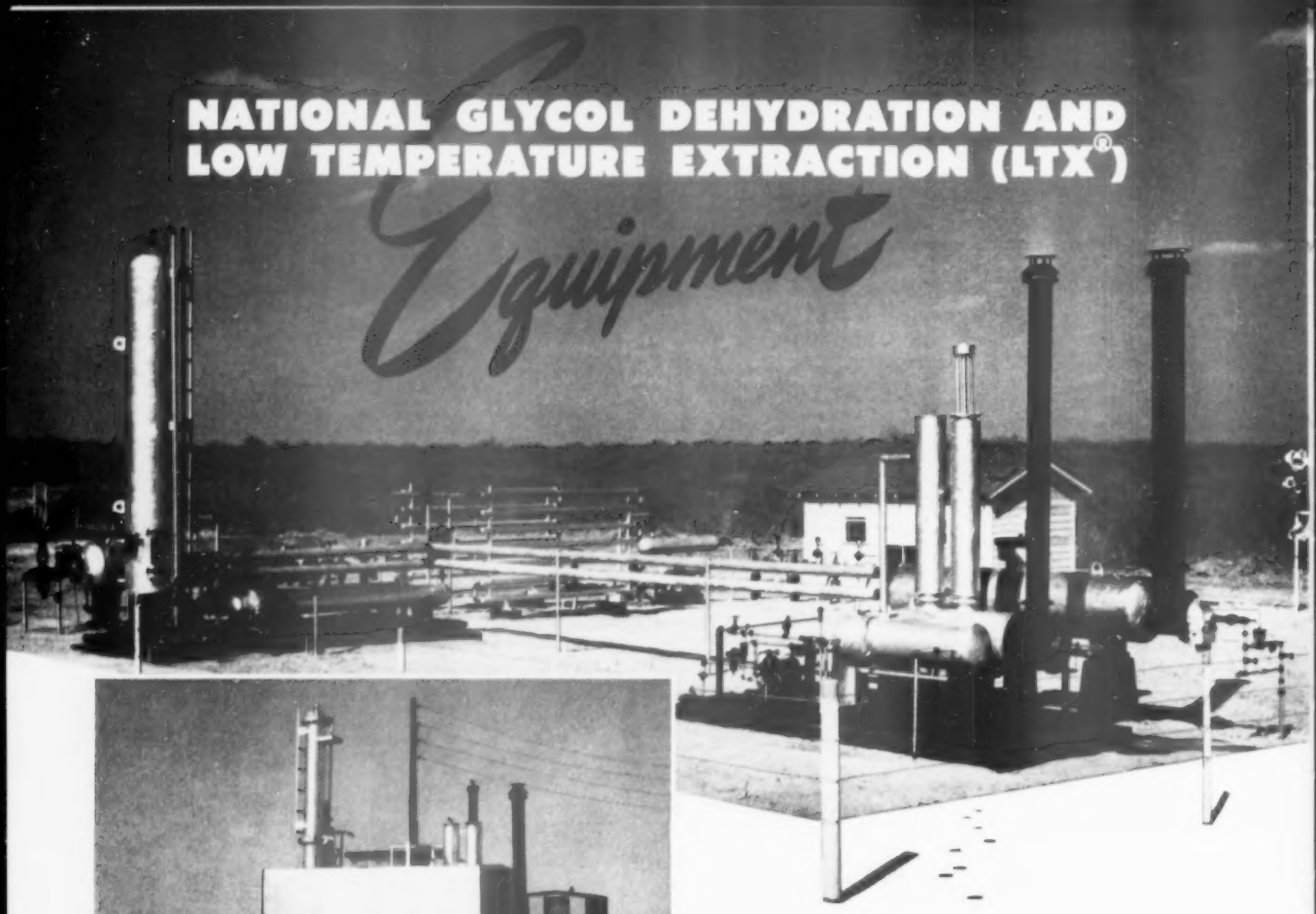
LEGAL

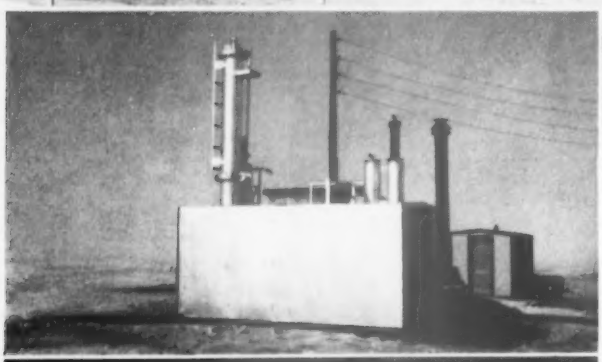
U. S. Department of the Interior, Bureau of Land Management, Washington 25, D.C. Notice is hereby given that approximately 179.38 acres of land in T. 13 N., R. 12 W., within the known geologic structure of a producing oil or gas field (undefined) situated in Salt Creek Township, Muskingum County, Ohio, will be offered in two parcels for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre, at 1 p.m., Eastern Standard Time, July 1, 1953, when bids will be opened. Details of the lease offering, how and where to file bids, and a description of the lands may be obtained by addressing an inquiry to this office. Edward Woozley, Administrator.

LEGAL

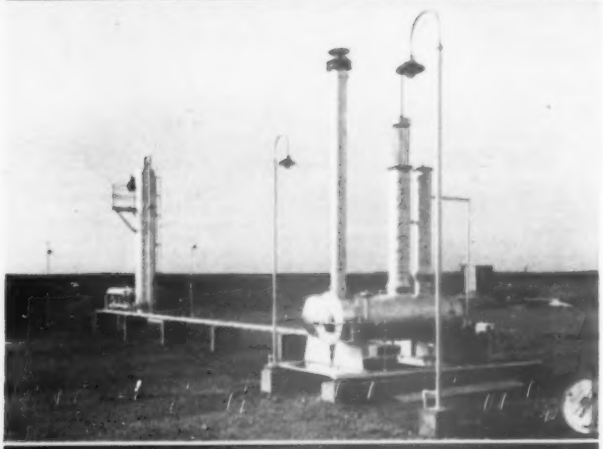
U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington 25, D. C. Notice is hereby given that 160 acres of acquired land of the United States in T. 34 S., R. 40 W., and 80 acres of public domain land in T. 33 S., R. 41 W., 6th P.M., Kansas, all within the known geologic structure of the Hugoton gas field, will be offered for oil and gas leasing, through competitive bidding to the qualified bidder of the highest cash amount per acre, at 1 p.m., Eastern Standard Time, June 17, 1953, when bids will be opened. Details of the lease offering, how and where to file bids, and a description of the lands may be obtained upon request from this office. Edward Woozley, Administrator.

NATIONAL GLYCOL DEHYDRATION AND LOW TEMPERATURE EXTRACTION (LTX®) Equipment





National 500 mcf/day, 125 # WP Glycol Dehydrator — N. Dakota



National 17 mmcf/day, 1000 # WP Glycol Dehydrator — Kansas

A 30" x 12½', 1200 psi LTX with Glycol Injection and a 24" x 15', 300 psi Stabilizing Desorber for 10,000 mcf per day operating on lease in South Texas.

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